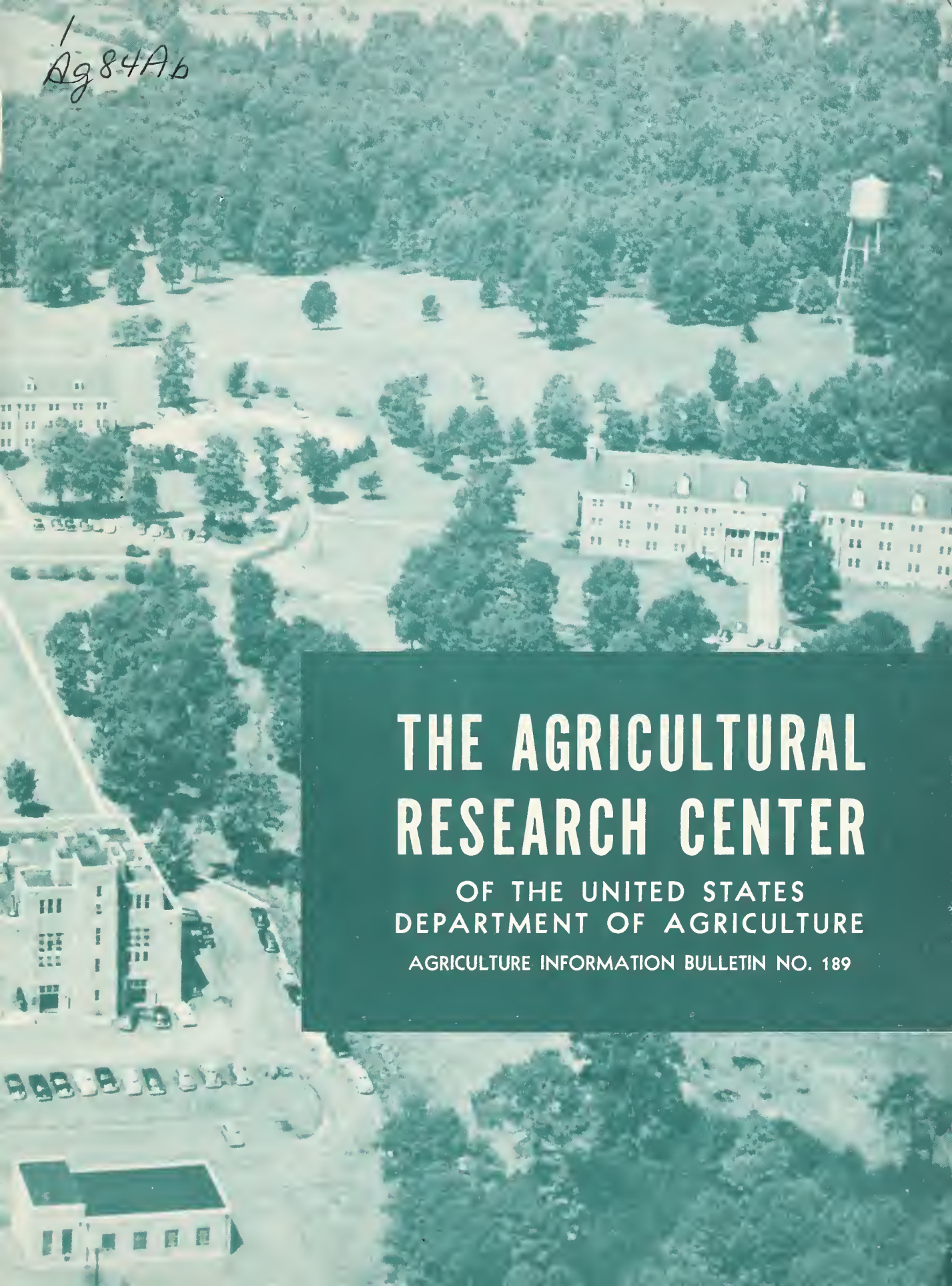

THE AGRICULTURAL RESEARCH CENTER

OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

AGRICULTURE INFORMATION BULLETIN NO. 189

DIRECTORY FOR VISITORS

Visiting Hours: Monday through Friday, 8 a.m. to 4:30 p.m.; closed on Saturdays, Sundays, and holidays.

UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D.C.

Representative	*Building*	*Room*	*Telephone*	*Extension*	*Agency Represented*
Lewis P. McCann (Chairman for group visits to Beltsville).	Administration Building.	532	DUdley 8-3697	.....	Foreign Research and Technical Programs Division, Agricultural Research Service.

AGRICULTURAL RESEARCH CENTER, BELTSVILLE, MD.

C. A. Logan (Superintendent, Agricultural Research Center Operations). E. T. Harden (Asst. Superintendent).	Center Laboratory Building (3-307).[1]	121	GRanite 4-4800	412	Operations and Management.
V. L. Simmons (Coordinator of domestic and foreign visitors at the Agricultural Research Center).	Center Laboratory Building (3-307).	121	GRanite 4-4800	413	Fish and Wildlife Service of the Department of the Interior, Patuxent Wildlife Research Center. Forest Service. Soil Conservation Service: Cartographic Division. National Plant-Materials Center. Soil Survey.
H. P. Lanchester	Entomology Laboratory A (4-476).	100	GRanite 4-4800	207	Agricultural Marketing Service: Grain Division. Agricultural Research Service: Entomology Research Division. Plant Pest Control Division.
John H. Martin Clarence S. Slater	Administration Building (AO-003), Plant Industry Station.	12	GRanite 4-6500	664	Agricultural Marketing Service: Market Quality Research Division. Agricultural Research Service: Agricultural Engineering Research Division. Crops Research Division. Soil and Water Conservation Research Division. Forest Service: Forest Physiology Laboratory.
J. O. Butcher R. L. Davis	Dairy Physiology Building (1-173).	1	GRanite 4-4800	222	Agricultural Research Service: Animal Disease and Parasite Research Division. Animal Husbandry Research Division. Eastern Utilization Research and Development Division (cheese and meats).
Mrs. Zelta F. Rodenwold	Center Laboratory Building (3-307).	115	GRanite 4-4800	398	Nutrition and Consumer-Use Research.

[1] Numbers in parentheses refer to building directory on pages 22-23.

THE AGRICULTURAL RESEARCH CENTER

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Agriculture Information Bulletin No. 189

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE
Washington, D.C.
Revised August 1962

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. - Price 35 cents

CONTENTS

THE AGRICULTURAL RESEARCH CENTER

What It Is

The Agricultural Research Center is administered by the Agricultural Research Service (ARS) of the U.S. Department of Agriculture. Most of the ARS research divisions do part of their work at the Center. These are the Agricultural Engineering, Animal Disease and Parasite, Animal Husbandry, Clothing and Housing, Crops, Entomology, Human Nutrition, and Soil and Water Conservation Research Divisions; the Eastern Utilization Research and Development Division; and the control and regulatory divisions of Meat Inspection, Pesticides Regulation, and Plant Pest Control.

Other Department of Agriculture agencies that carry on research at the Center are the Agricultural Marketing Service, Forest Service, and Soil Conservation Service.

A few other units of the United States Government conduct research at the Center. They are radio station WWV of the National Bureau of Standards of the Department of Commerce, the Mineral Deposits and the Geochemistry and Petrology Branches of the Geological Survey of the Department of the Interior, and the Research Branch of the Division of Veterinary Medicine, Food and Drug Administration of the Department of Health, Education, and Welfare. Adjoining the Center is the Patuxent Wildlife Research Center, where the Fish and Wildlife Service of the Department of the Interior studies wildlife problems that relate to agriculture. Also adjoining the Center is the Goddard Space Flight Center of the National Aeronautics and Space Administration, a civilian agency for space science research.

Agricultural research at the Center deals mainly with broad problems of national interest. Much of it is basic, or fundamental, research. Its aim is to accumulate scientific information that can be applied elsewhere. Often two or more divisions or agencies work together, combining the talents and experience of several groups of Department scientists. Many of the projects are carried on in cooperation with one or more State agricultural experiment stations. This cooperative research has led to countless discoveries that have contributed greatly to bringing American agriculture to its present high level.

When thoroughly proved, results of all research work done in cooperation with the Department are made public through the Department's Office of Information in Washington, D.C.

The Agricultural Research Center covers about 10,000 acres. The land is divided into experimental pastures, ranges, orchards, gardens, fields for cultivated crops, timber stands, and soil-treatment plots. The Center has 1,160 buildings that are equipped to meet the needs of special kinds of research and to provide office and laboratory space for approximately 2,800 employees. About half of these employees are scientists or technicians; the others are clerical, farm, and maintenance workers. Those doing research include agronomists, animal husbandmen, apiculturists, architects, bacteriologists, biochemists, biologists, botanists, chemists, dairy technologists, engineers, entomologists, geneticists, grain technologists, helminthologists, home economists, horticulturists, mycologists, nematologists, nutritionists, olericulturists, parasitologists, pathologists, physicists, physiologists, statisticians, veterinarians, and zoologists.

Among the Center's buildings are 67 laboratories; 36 greenhouses; 180 storage buildings; and 700 barns, small-animal, and poultry houses. In addition, there are shops; an apiary; a granary; a warehouse; and heating, water-treatment, and sewage-disposal plants.

The Center has nearly 3,800 experimental farm animals, more than 11,000 laying and breeding fowls, and about 3,500 small animals that are used in laboratory tests. Most of the dairy herd of 500 cattle are Holsteins or Jerseys.

Where It Is

The Agricultural Research Center is near Beltsville, Md., 15 miles northeast of Washington, D.C. It occupies two separate tracts on opposite sides of the Washington-Baltimore Boulevard, U.S. Route No. 1. On the northwest side of the highway, 2½ miles northeast of the University of Maryland, is the Plant Industry Station, administrative headquarters of Agricultural Engineering, Crops, Entomology, and Soil and Water Conservation Research Divisions. About a mile northeast of the Plant Industry Station, on the east side of the highway, is the entrance to the larger tract, site of the other activities of the Center. Administrative headquarters of the Animal Disease and Parasite and Animal Husbandry Research Divisions are located here. The Baltimore-Washington Parkway passes through the Center about 3 miles east of U.S. Route No. 1. Access roads to the Center lead off the Parkway at Powder Mill Road. The map on pages 22–23 shows the boundaries of the Center, highways and access roads, and location of the buildings.

How To Get There

The best way for an individual or a small group to visit the Center is by automobile, because many of the buildings are some distance from public transportation. Large groups frequently charter a bus. When this is done, ARS will, by appointment, supply a guide to describe the activities of the Center from 8 a.m. to 4:30 p.m. during regularly scheduled workdays, Monday through Friday. Buildings, laboratories, and barns are closed to the public on Saturdays, Sundays, and holidays.

The Center may also be reached by Greyhound buses, which stop on U.S. Route 1 at the Plant Industry Station and at Beltsville. Two special Greyhound buses leave the terminal at 12th Street and New York Avenue NW. in Washington at 7 a.m., Monday through Friday, arriving at the office of the Superintendent of the Center at 7:55 a.m. This office is 2 miles from the regular bus stop at Beltsville.

Visitors Welcome

Persons interested in research to improve farming, agricultural marketing, and farm living are always welcome at the Center, where a small staff is available to explain the work. In fiscal 1961, about 20,000 persons visited the Center. They came from all the States and Puerto Rico, and from 105 foreign countries.

Visitors who wish to consult scientists at the Center should make appointments through the designated representatives listed inside the front cover of this publication. Visitors who wish to see the Beltsville Parasitological Laboratory must also make appointments.

Two cafeterias at the Center serve luncheon. Advance luncheon arrangements are necessary when large groups are to be served.

This publication is intended as a general guide. A directory for visitors is inside the front cover. Brief descriptions of the work done at the Center follow.

AGRICULTURAL RESEARCH SERVICE

Farm Research

Agricultural Engineering Research Division

The Agricultural Engineering Research Division, which has headquarters at the Plant Industry Station, conducts a coordinated program of fundamental and applied research relating to the engineering aspects of crop production, harvesting, and farm processing; livestock and farm structures; and farm application of electric energy. Research at Beltsville is in close cooperation with allied research divisions.

Farm Housing

Five expansible houses have been built at the Center. Relatively new materials were used, including lightweight concrete blocks, special large bricks, and asbestos-cement and aluminum sheets for exterior walls; and aluminum, plywood, and plastic sheets and fiberboards for interior walls. Different types of heating equipment, including a heat pump for heating and cooling, were installed in the houses. Livability, temperature, humidity, and radiation studies have been made and data obtained on moisture movements under concrete floor slabs on the ground. Studies are continuing on the effects of temperature and tightness of construction on bodily comfort of the occupants during winter.

The houses are occupied by workers from the Center dairy farm. Information on their livability is being obtained in cooperation with the Clothing and Housing Research Division, which helped adapt the house plans to farm-family requirements.

(*A*) Experimental building with insulated, reinforced mortar-surfaced curtain wall panels. Each quadrant of the hyperbolic paraboloid roof is coated with a different material.

(*B*) Hyperbolic paraboloidal shapes present a natural form to fully utilize the inherent tensile strength of thin sheet materials like steel, aluminum, plywood, or hard board.

Materials and Construction Methods for Farm Buildings

Agricultural engineers are concerned with increasing the serviceability and reducing the costs of farm buildings. New materials and construction methods, as well as improvements of existing ones, are developed and tested. Small buildings are constructed experimentally and service tested. Structural components of larger structures—both full scale and model—are likewise constructed and studied analytically to determine stress distribution patterns and other design data.

Making and Storing Hay and Silage

The engineering requirements for improved silage and hay harvesting, processing, storing, and feeding systems are being studied in cooperation with crops specialists, animal nutritionists, and farm-equipment manufacturers. Studies have been made on the preservation efficiency of field curing, barn drying, dehydration, and ensiling of forage crops. Studies have also been made on the effects of hay crushing and crimping, the capacities of direct-cut and pickup choppers, and the strength requirements for bunker silos.

Agricultural engineers are working on the evaluation of wafering machines, the handling and drying of wafers, and the methods of storing half-dry silage. They are seeking to determine silage densities with radiation techniques and to protect and rehabilitate walls of tower silos. Storage studies on techniques for sealing both upright and horizontal silos to prevent air contamination of silage are continuing.

Plans of Farm Buildings

The Cooperative Farm Building Plan Exchange, with offices at the Plant Industry Station, develops plans for improving farm buildings in cooperation with committees representing the State agricultural colleges of the northeastern, southern, and western regions. The plans are made available to farmers through the State extension services.

Design Criteria for Poultry Houses

Scientists of the Agricultural Engineering Research Division and the Animal Husbandry Research Division are using two respiration calorimeters and five climatic chambers to evaluate the effects of weather on the growth and production of poultry. Major emphasis is on caged layers, but heat and moisture dissipation rates of broilers and turkeys have also been determined. Design criteria for constructing poultry shelters and ventilation systems are the goal. The effects of such factors as temperature, humidity, wind, carbon dioxide, and ammonia concentration on egg production, feed and water consumption, and bird health are being studied.

Electrical Equipment for Livestock Farming

Equipment for complete year-round ventilation and air conditioning is studied to detect functional problems, required controls, performance require-

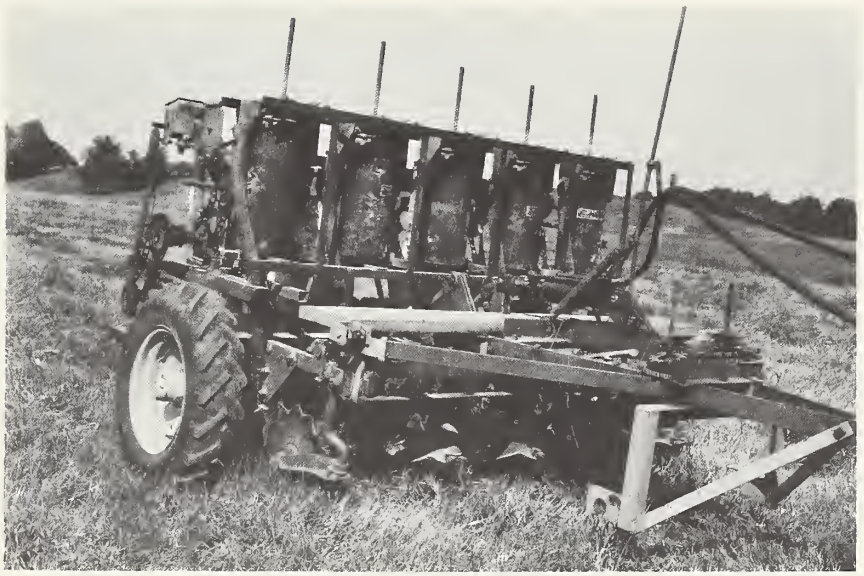
Engineered system of dairy stable ventilation for summer and winter.

ments, and effects on livestock and poultry.

In cooperation with engineering specialists in building design and arrangement, research is being conducted on livestock management practices and performance of electrical equipment in use in livestock production. Electrically controlled and powered equipment is developed to reduce labor in livestock production. Performance requirements and characteristics of such equipment are determined in relation to automatic control and elimination of manual labor and supervision.

Methods and equipment to provide standby electric power when local service is disrupted have been studied. Although such standby service may be used only a few hours a year, the performance required is exacting. Most farm-wiring systems and equipment require a current with the following characteristics: Dual voltage, 3 wires, 115 to 230 volts, single phase, and 60 cycles. The generator may be powered by an integral engine or farm tractor.

Special measurements required for research on farm electrical equipment and related activities are made at the Instrumentation Laboratory.



F–3347

Drill designed for grassland-establishment experiments on prepared seedbeds or in existing sod. Fertilizer and seeds may be broadcast and drilled or planted at different depths and spacings.

Improving Planting and Fertilizing Machinery

At the Agricultural Engineering Laboratory, engineers design and build special planting and fertilizing machines and equipment. The planting machines include seeders and planters; the fertilizing equipment includes attachments to side dressers and to subsoiling machines that can apply both dry and liquid fertilizers. By conducting field experiments in cooperation with other ARS units and State agricultural experiment stations, the most efficient methods of planting and fertilizing various crops can be determined for all regions of the country. Cooperative studies involving more than 40 field and vegetable crops in more than half the States have helped industry provide better farm machinery.

Current studies include pasture-establishment and renovation equipment and methods, new techniques for seed and fertilizer placement of small grains, and fertilizer placement requirements for seeded and transplanted tomatoes.

Field studies of mechanical methods for removing radioactive contaminants from the soil are also conducted here, in cooperation with the Soil and Water Conservation Research Division, under contract with the Atomic Energy Commission. Conventional and modified farm machinery and specially constructed equipment are tested under a wide variety of crop and soil conditions for their effectiveness in removing simulated radioactive fallout from the soil surface.

Animal Disease and Parasite Research Division

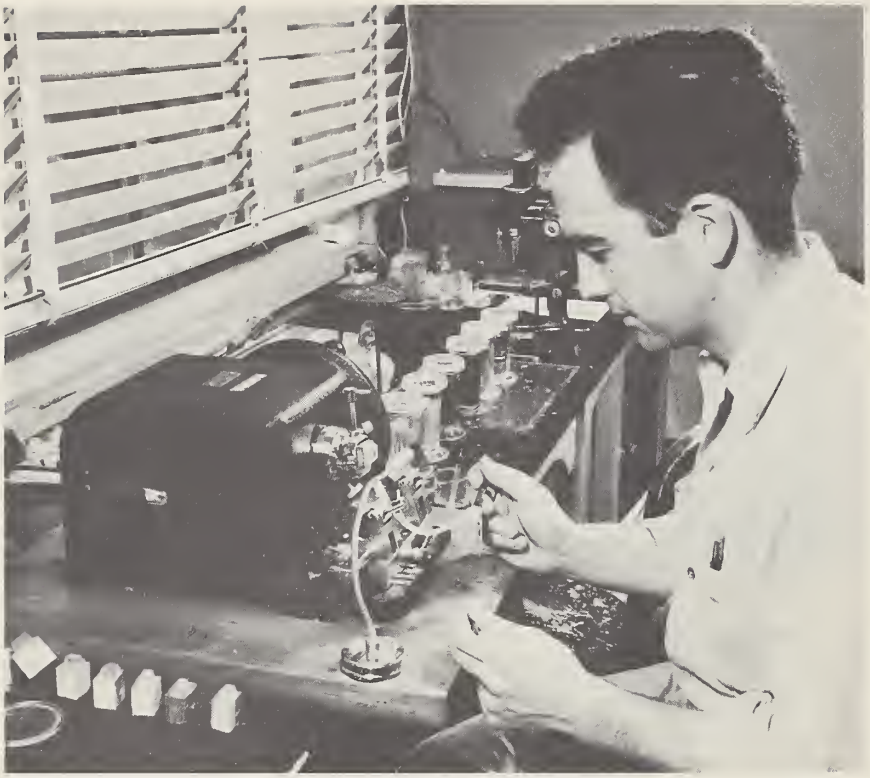
The Animal Disease and Parasite Research Division conducts a closely coordinated, fundamental, and applied research program directed primarily toward developing measures and techniques for preventing, controlling, and eradicating communicable diseases and parasites of domestic animals, poultry, and fur-bearing animals raised in captivity. In addition to the Division headquarters, the Parasitological Laboratory, which is one of the larger components of the Division, is located at the Center.

Strategy Against Livestock Parasites

Investigations of animal parasites include studies of external and internal pests of farm animals and poultry from the standpoints of (1) identity and structure of the organisms, (2) geographic distribution in the United States and elsewhere in the world, (3) life cycles and modes of transmission, (4) injurious effects produced and defense mechanisms developed by infected animals to confine the injuries, (5) treatment of infected animals with curative and preventive drugs and chemicals, and (6) prevention of parasite spread by management practices and by increased utilization of natural factors that tend to control parasitism.

Beltsville Parasitological Laboratory

The Beltsville Parasitological Laboratory utilizes about 350 acres, approximately one-third of which is planted to feed crops for experimental animals.



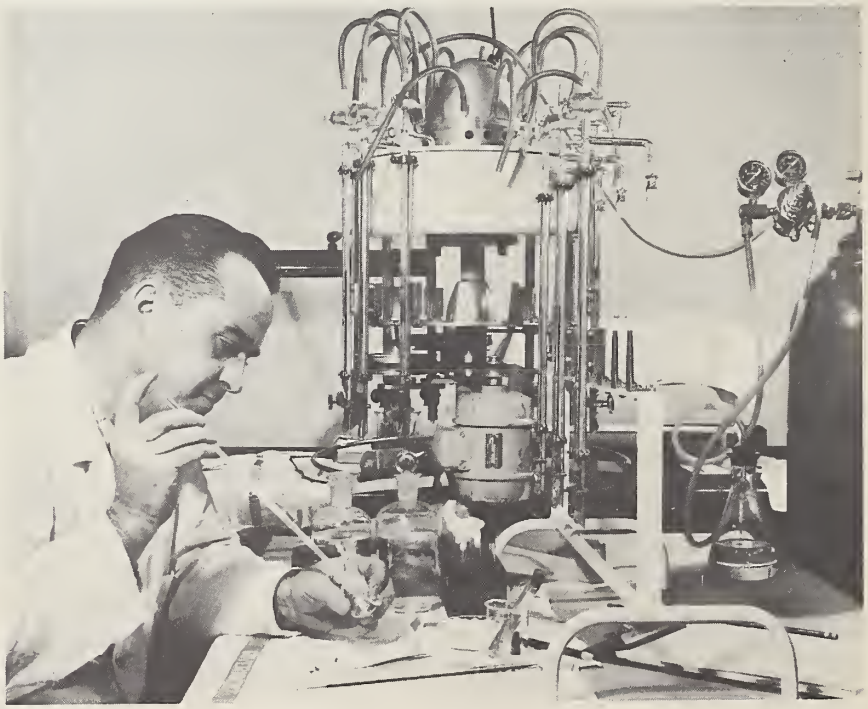
N–16769

Preparing for study parasite tissue and host tissue injured by parasites.

At this laboratory, zoologists, veterinarians, chemists, and technicians study the vast number of parasites that attack livestock and poultry and develop treatments and control measures to protect domestic animals and birds from parasites. Part of the strategy in waging war on these pests is to determine the most vulnerable points in their life cycles and then develop measures to break the cycle and thereby circumvent their attacks on animals and birds.

Important medicinal treatments that have become standard practice throughout most of the world have developed from this research. Treatments with phenothiazine for removing injurious worms that infest horses, cattle, sheep, goats, swine, and poultry were developed at the Center. Treatments with sodium fluoride for removing roundworms from swine, and treatments with lead arsenate for removing tapeworms from sheep, were also developed. This research has led to improved methods of using drugs for preventing and controlling coccidiosis and worm parasites in chickens and turkeys. Moreover,

Over 200 structures occupy the rest of this tract and provide facilities for the personnel and their equipment, and for the animals used in their studies. Among these structures are a central laboratory building with facilities for more than a dozen scientists, and a building that houses the internationally known Index-Catalog of Medical and Veterinary Zoology and the parasite collections. The latter building also provides working quarters for visiting scholars, who come from every continent to use the Index-Catalog and the collections. Several other buildings occupy the central area, and barns for large animals are located nearby. However, most of the structures are fieldhouses and small isolation quarters, often designed to accommodate a single animal for critical study. Approximately 600 large animals (including cattle, swine, sheep, and goats) and more than 5,000 chickens and turkeys are used each year for experimental purposes. Most of these animals are reared on the premises.



N–16770

Using a modern precision instrument to study the physiology of microscopic parasites, some of which cause reproductive failures in cattle.

much important knowledge on trichinae in swine, tapeworm cysts in beef cattle, and other parasites of farm animals transmissible to man has stemmed from the research at the Center on livestock parasites. The precise nature of the injuries produced by certain parasites of cattle, sheep, and swine and much basic information on the biology of these parasites have been disclosed during these studies.

A unique feature of the parasite research at the Center is the work on the Index-Catalog of Medical and Veterinary Zoology. This publication has attracted worldwide attention and has contributed greatly to a better understanding of parasitism as a world problem in relation to livestock production and human health. The parasite collection at the Center, probably the largest of its kind, facilitates parasite identification because it affords a comparison of forms already identified with those under investigation. The parasite collection and the Index-Catalog are of immense value in formulating control programs aimed at preventing exotic pests from entering the United States.

These and many other activities underway at the Center have helped to make livestock and poultry raising safer and more profitable. Sometimes the results of research show how a combination of methods can best be used. For example, research workers found that larvae of the stomach and nodular worms and other injurious internal parasites of sheep did not survive more than 4 months under pasture conditions. This finding formed the basis of a control program that included treating the breeding flock with phenothiazine late in the fall and early in the spring and then placing the sheep on pasture that had been allowed to lie idle over the winter. Other studies showed that pigs infected with kidney worms did not pollute their quarters and pastures with the parasite eggs until the worms had existed in them for many months. This finding has suggested a possible way of reducing, and perhaps even eradicating, these pests by using only young sows, presumably still uninfected, for pig production. This control method is now being tested in the field.

N–16767

Obtaining identified specimens of animal parasites from the collection housed at the Center.

Animal Husbandry Research Division

The headquarters of the Animal Husbandry Research Division are located at the Agricultural Research Center. Extensive research studies are underway there to develop new and improved methods of livestock production, including more efficient breeding, feeding, and management of beef, dual-purpose, and dairy cattle, poultry, sheep, goats, and swine, and processing and preserving their products. The Nation's rapidly growing population emphasizes the need for more intensive livestock production, while at the same time current economic conditions stress the need for greater efficiency in farm- and livestock-production practices.

Beef Cattle Research Branch

This Branch carries on research in breeding, nutrition, physiology, and management of beef and dual-purpose cattle. The research studies at the Center emphasize beef cattle nutrition and physiology.

Studies at the Center on ruminant bloat have provided much basic information on possible causes of both pasture and feedlot bloat, but no reliable preventive measures are yet known.

Poor reproductive performance, evidenced by low percentage of the calf crop, is the most important problem of the beef industry. Estrus, ovulation, conception rates, and embryo survival are being studied at the Center. Nutritional factors studied include feeding varying levels of total feed (energy and protein) to breeding females.

Experiments were started in 1950 with identical twin cattle to determine the effects of continuous versus interrupted growth on beef cattle. At present, identical twins are being used in studies comparing performance and carcass characteristics of bulls and steers. The particular objective of this research is to determine whether performance of a bull is indicative of what he would do if steered. This question is important in beef cattle performance testing.

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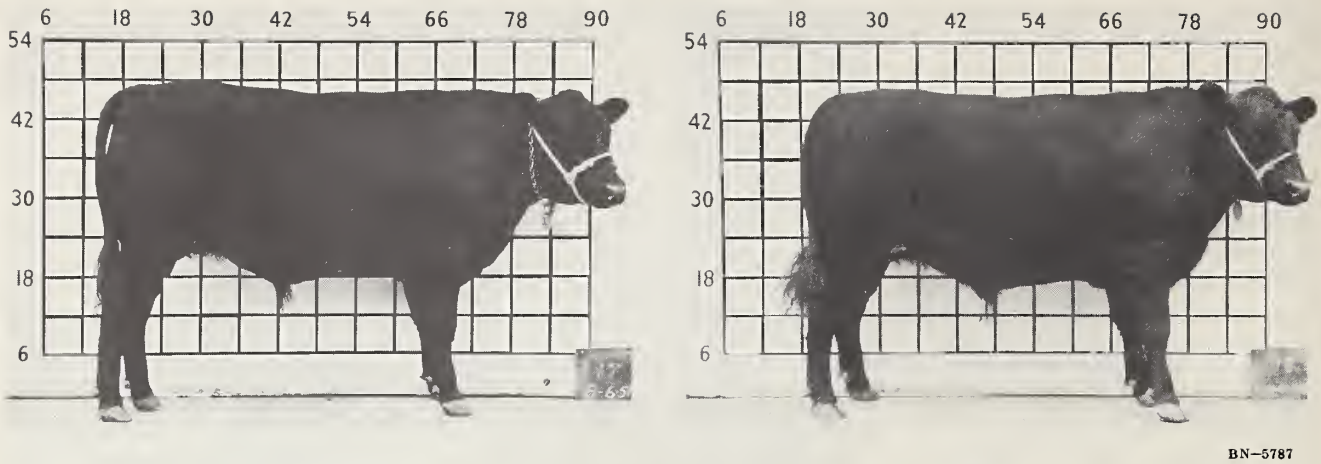


Steer A

Steer B

Identical twin steers, each photographed when it reached 1,000 pounds. Steer A was continuously well fed. Steer B was on a maintenance ration for 6 months, then returned to full feed. Steer A reached 1,000 pounds 2 months sooner than steer B.

Past research on beef cattle at the Center, as well as similar research at other locations, has shown that (1) feeding pelleted high-roughage rations increases consumption, rate of gain, and efficiency; and (2) feeding pelleted high-concentrate rations does not affect gains but tends to reduce consumption and increase efficiency. Current research at the Center is aimed at determining basic physiological effects of consuming pelleted feed.

Pasture studies are underway to determine whether grazing beef cattle and sheep together has advantages over grazing them separately. Performance of animals and effects on parasite levels and on pasture stands and composition are measured. This study is conducted in cooperation with the Crops and the Animal Disease and Parasite Research Divisions.

Dairy Cattle Research Branch

Dairy research at the Center is concerned with the problems that affect the efficiency and profitableness of dairy farming. The work includes (1) studies in breeding and management to improve the milk-producing ability of dairy animals; (2) determination of nutritional requirements for normal growth, lactation, and reproduction and the feeds or feeding regimes that will supply the needed nutrients most efficiently; (3) investigations of the physiological factors affecting the general usefulness of dairy cattle; and (4) collection and analysis of data from production testing associations (DHIA) throughout the country.

The experimental herds used for breeding and nutrition studies consist of about 500 animals of all ages, including Holsteins, Jerseys, and crossbreds of various breeds. The facilities are barns to house the experimental herds and offices and special laboratories for the administrative and research staff. About 50 specialists in genetics, animal breeding, anatomy, physiology, chemistry, bacteriology, nutrition, and dairy husbandry work on about 60 projects. Approximately 600 acres are used for pasture and hay crops in connection with dairy operations.

Building Better Dairy Herds.—One problem in breeding dairy cows is the large number of low milk producers that are born every year. It has been estimated that one-third of the country's dairy cows return a profit, one-third show neither profit nor loss, and one-third fail to pay for their keep. On dairy farms, cows that do not pay for their keep are usually culled. Since an objective at the Center is to get information on breeding, all females are raised and tested for production. Every effort is made to avoid practices that might alter the interpretation of results in terms of inheritance.

A herd of registered Holsteins was established at the Center in 1918. It was maintained for experimental purposes, chief of which was to determine the value of using proved sires. The females in this herd today total more than 240 and represent daughters of 24 sires. They are the result of from 6 to 11 generations of continuous proved-sire breeding. The number of low-milk-producing cows has gradually diminished with each succeeding proved-sire cross, and butterfat production per cow now averages about 700 pounds as compared with 540 pounds in the foundation herd—an increase of approximately 30 percent.

This herd is presently serving as a foundation group for a new experiment in which three systems of mating are being compared. One-third of the herd is being used to continue the present practice of utilizing superior proved sires that are distinctly unrelated to each other. Another third of the herd is being closed, and improvement will be attempted through selection and inbreeding. The final third is being bred

to superior proved sires of breeds other than Holstein-Friesian. All the sires are selected on the basis of those showing the most promise of maintaining or increasing the existing levels of milk, butterfat, and solids-not-fat. Young sires developed from each plan of mating are loaned to cooperating dairymen, so that a comparison can be made of the results of the three systems of mating on the performance of the cows and the bulls. Sire services for this research are being obtained from artificial-breeding organizations through the cooperation of the National Association of Artificial Breeders.

Proved sires of the Holstein, Jersey, and Red Dane breeds crossed with females of these breeds and Guernsey were used in the original crossbreeding experiment, started in 1939. This study has been completed and a new one started to compare the results of crossbreeding to purebred matings through reciprocal crosses of the Holstein, Brown Swiss, and Ayrshire breeds. The differences in milk and butterfat production among the breeds used are being evaluated, and the effect of crossbreeding on these differences will be estimated.

After several years of research, a method has been developed that may make it possible to predict the potential milk-producing ability of a calf when she is only 4 or 5 months old. Examination by palpation of the udder shows marked differences in mammary-gland development in individual calves.

Breeders have long needed genetic information on the solids-not-fat portion of milk. The Dairy Cattle Research Branch has adapted the Watson-lactometer method, developed by Department scientists, for use in the field. New portable equipment that requires small amounts of milk for sampling has been developed experimentally and tested with cooperators.

Cooperative studies are being made with the Agricultural Engineering Research Division and the Eastern Utilization Research and Development Division on milk recording and milk handling, as well as on developing a marker that will make it possible to detect antibiotics in milk.

Dairy Cattle Nutrition.—Considerable emphasis in the research program is given to problems of preserving and processing grassland crops. In cooperation with the Agricultural Engineering Research Division, studies are conducted on the use of preservatives in silage, different types of silos, various types of covers for bunkers and stacks, and the effect of harvesting and storage procedures on nutrient preservation and silage quality.

In pasture research, different management systems are evaluated—rotational and strip grazing, zero grazing, and irrigation. Pasture mixtures of such plant species as millet, sudangrass, and bermudagrass are also being studied for use in special locations and under certain management practices.

The energy metabolism laboratory conducts fundamental and applied research on the energy evaluation of feeds and rations. Studies on the usefulness of feed additives—antibiotics and hormone supplements—and on the basic nutritional requirements of rearing dairy heifers are also included.

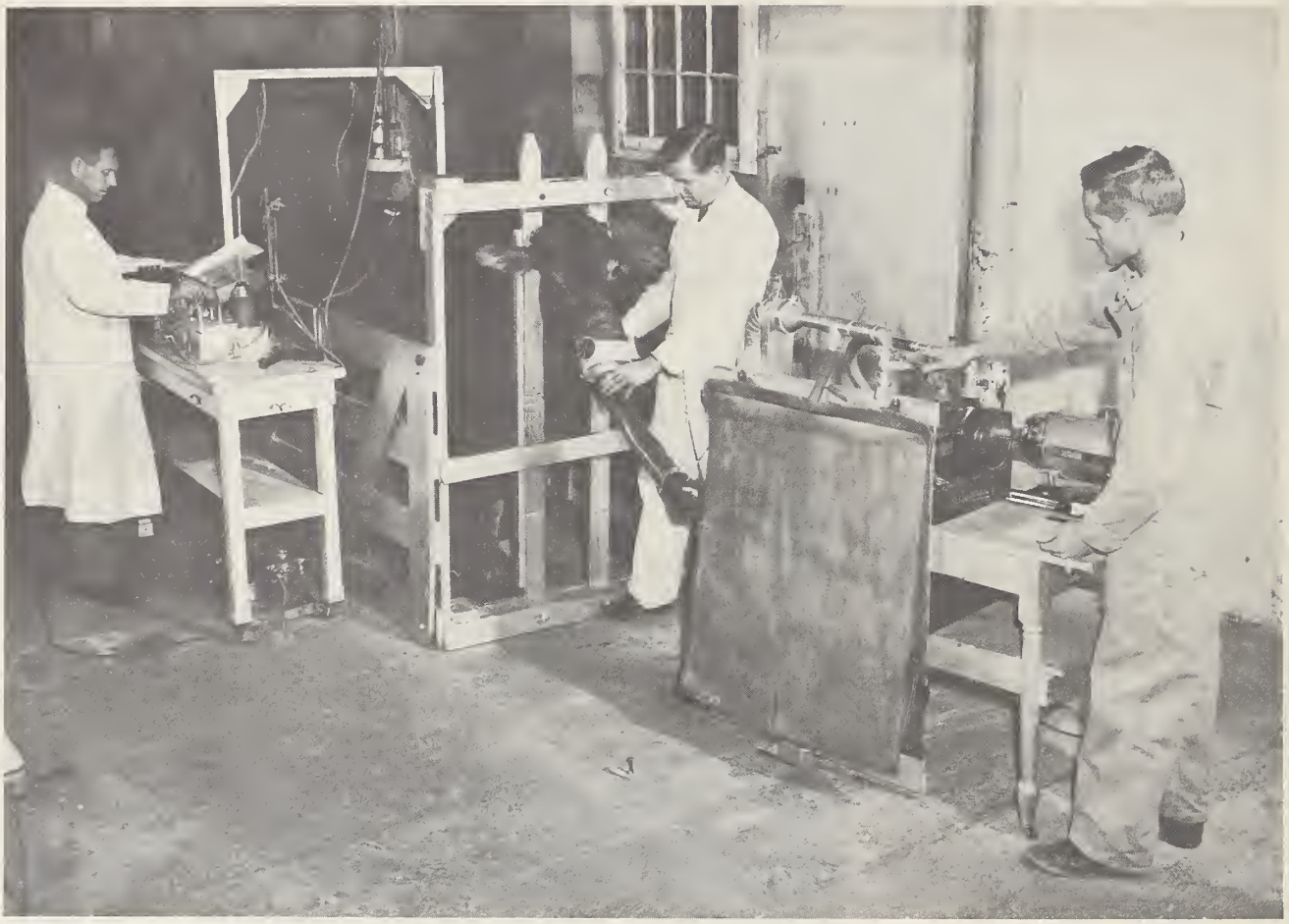
A rat colony is maintained for basic nutrition research. The colony has provided important leads in basic nutrition, especially in relation to vitamin B_{12}, and has provided data on the nutritional value of butter, butterfat, cheese, and other dairy products.

Physiology of Dairy Cattle.—Basic physiological studies are conducted in the general area of endocrine gland function and reproduction. Included are detailed studies of the role of hormones in animal growth, lactation, and reproduction, and possible methods of modifying their function to enhance the economic worth of the dairy animal.

Dairy Herd Improvement.—Standardized procedures for testing and reporting production records have made

BN–5783

Scientists study body conformation and anatomy of a dairy cow to learn how cattle develop and the relationship of their development to production.



N—12297

Scientists measuring respiration rate and volume and skin evaporation under hot conditions in the adaptability laboratory at the Center.

it possible to assemble at one point records from dairy animals throughout the country. Thus, the only data for studies of the genetic production potential of the national dairy herd are provided. As the volume of production records has increased, techniques have been developed to employ electronic processing equipment to make more rapid and effective use of information collected. These records are particularly valuable in assessing the potential of individual sires considered for use in artificial breeding. Forty percent of the dairy animals of this country are now bred artificially, and the yearly percentage is steadily increasing. These data will make possible a more judicious selection of the sires so used. Thus they are a vital link in the continued improvement of the dairy industry. These records also provide data for evaluating various testing plans, national trends in the dairy industry, and relationship between management practice and economic returns.

Meat Quality Laboratory

One objective of research in animal breeding, nutrition, and management is the production of more meat of better quality. To obtain this objective, the Division maintains at the Center a complete meat laboratory with facilities for slaughtering and processing experimental animals. These facilities are augmented by laboratories for chemical, biochemical, organoleptic, and histological evaluation of the meat, and also for statistical analysis of the data.

Studies of factors relating to palatability of the meat are made by trained taste panels and by objective techniques. Mechanical devices have been designed and are used to determine objectively tenderness and juiciness of the heated meat samples from the experimental animals.

To provide a basis for more efficiently immobilizing slaughter animals, as required by the Humane Slaughter Law, studies are being made of the several types of stunning instruments and their effect on the quality of the meat. These include the several kinds of mechanical and electrical instruments now employed in packing plants. In addition, contract research is being done on gas immobilization and nerve response to electrical immobilization.

Poultry Research Branch

Poultry research involves basic and applied studies in breeding, nutrition, physiology, and products. The experimental poultry plant covers 130 acres and includes 4 office-laboratory buildings, a large, modern brooder house, several ranges for rotation of rearing programs, laying houses for 8,000 pullets, and many smaller houses for special purposes. Facilities include additional space for brooding, rearing, and breeding turkeys. Large numbers of chickens and turkeys are reared or housed in battery cages to provide more carefully controlled experimental conditions. Various breeds and varieties of chickens and turkeys will be found in the research flocks, depending upon the purposes of particular experiments.

Poultry Breeding.—Emphasis in previous experiments has been on developing superior stocks of chickens and turkeys. Current work is directed toward increasing our fundamental knowledge of genetic principles and determining the genetic parameters required to devise and evaluate the most efficient methods of improving domestic poultry through breeding.

The Beltsville Small White Turkey.—The Beltsville Small White turkey is the product of an experiment in the pedigree breeding of turkeys, with the specific objectives of small size, quick market maturity, compact meaty body, and good reproductive ability. Average weight at full market maturity (22 to 24 weeks old) is about 7 pounds ready-to-cook for the hens and about 12 pounds for the toms. Several types and strains of turkeys were combined to produce the new turkey, which was admitted to the American Standard of Perfection in 1951 as a new variety.

After World War II, the Beltsville Small White turkey was widely accepted by the industry and became well established in the United States. In recent years production has declined, however.

National Poultry and Turkey Improvement Plans.—The National Poultry and Turkey Improvement Plans are administered from the Center. Through these programs, the Agricultural Research Service cooperates with the States and industry in formulating provisions to govern the classification of breeding stock, hatching eggs, chicks, and poults produced by participating hatcheries, breeders, and flockowners.

More than 60 percent of the hatcheries with more than 75 percent of the hatching egg capacity in the United States participates in these programs. The National Plans staff also compiles and distributes the results obtained from stock entered in performance tests.

Poultry-Product Quality.—Poultry-product technologists are studying the effects of different breeding, feeding, and management practices on the meat yield, carcass composition, and carcass quality of chickens and turkeys.

Poultry Physiology.—Studies on the reproductive processes of the hen have been concerned mainly with the maturation and ovulation of the ovarian follicle. Current work is directed toward the identification of central nervous structures or regions involved in mediating control of gonadotrophic activity of the pituitary.

One of the most remarkable discoveries in the poultry investigations at the Center has been that of parthenogenesis in turkeys—reproduction from unfertilized eggs. The phenomenon is a natural occurrence and seems especially prevalent in eggs of the Beltsville Small White variety. By selection, the incidence of parthenogenesis has been greatly increased, particularly that of advanced embryonic development and

BN—5786

Breeding, feeding, and management experiments result in high-quality, plump-breasted chickens and turkeys.

production of live poults. All parthenogenetic birds have been males. Semen from mature individuals has been used successfully in artificial insemination of females. The offspring of these matings are of both sexes. The cells of parthenogenetic turkeys tend to carry the diploid chromosome number, which appears to be restored during somatic division. This would mean complete homozygosity. Such animals are of especial interest and value in connection with tissue transplantation, immunity responses, and related physiological investigations.

N–39107

Chicken-turkey hybrid hatched in 1960 following insemination of a virgin Beltsville Small White turkey hen with semen from a Dark Cornish chicken.

One of several parthenogenetic turkey males raised to maturity and having sired offspring.

In collaboration with the Farm Electrification Research Branch of the Agricultural Engineering Research Division, investigations have been in progress for several years on the effects of variables in lighting on the reproductive performance of Beltsville Small White turkeys.

Poultry Nutrition.—Nutritionists at the Center recognized that soybean oilmeal would not give good hatchability and livability when used as the only protein concentrate in the hen's diet. They found that the addition of animal protein or a water extract of dried cow manure would correct this condition. After the discovery of B_{12}, this vitamin was shown to be the active factor in the animal protein and in the cow-manure concentrate. Further work at the Center showed animal and fish byproducts to be good sources of the vitamin. These studies led to the discovery that fish byproducts contain, in addition to B_{12}, another growth factor that is still unidentified.

More recently, the egg yolk has been found to contain a factor that is different from the fish factor and that stimulates chick growth and improves feed conversion. The egg-yolk factor is soluble in fat solvents, whereas the fish factor is water soluble. Work with inedible fats and oils and poultry byproducts indicates that these materials are well utilized by poultry, since they improve both rate of gain and feed conversion. This finding has been of considerable economic importance, since it created markets for products that were either surplus or waste and at the same time proved them to be of benefit to the poultry industry.

Sheep and Fur Animal Research Branch

More Productive Sheep.—About 1,400 sheep are used at the Center in studies on breeding, feeding, and management.

Breeding investigations involve a long-term program of comparing selected purebred matings of Hampshire, Shropshire, Southdown, Delaine Merino, Dorset, Suffolk, and Targhee sheep with many of the possible two- and three-way crosses of these breeds in respect to fat lamb and wool production under farm flock conditions. Experimental work has shown that crossbreeding results in increased production of lambs and wool over the average production of the parent breeds.

A new crossbred strain has been developed for both fat lamb and wool production under Eastern United States environmental conditions by mating Columbia rams to Southdale (Southdown X Corriedale) ewes.

New work is being initiated on selection for strains that will lamb more frequently and at any time of the year.

Approximately 100 sheep are used each year solely in nutrition research; and, in addition, applied nutritional research is conducted with the breeding flock.

Basic research is directed toward metabolic disorders such as bloat and urinary calculi; rumen metabolism and the effect of diet on the synthesis of amino acids and proteins by microorganisms; calorie-intake and protein requirements for maintenance, reproduction, and growth; and new and better methods of evaluating pastures and forages.

New and improved techniques such as the use of X-ray movies (cooperative studies with the New York State Veterinary College) and radioactive isotopes (cooperative studies with the Atomic Energy Commission) have added to the fundamental knowledge concerning ruminal motility, eructation, and metabolic activity within the rumens of sheep.

Cooperative work with the Crops Research Division has yielded promising results in the selection and development of new and improved forage plants for sheep.

Cooperative research with the Beef Cattle Research Branch of this Division and the Crops and the Animal Disease and Parasite Research Divisions is showing that rates of gain of sheep pastured with cattle are greater than those of sheep pastured alone. Approximately 250 sheep are used in these studies.

Applied nutrition work with the breeding flock is being directed toward such problems as supplemental feeding

N—42383

Some nutrition experiments are conducted in laying cages.

of sheep during drought periods and during the breeding and lambing seasons and toward the selection of pasture species and methods of pasture management that will yield the maximum production of lambs and wool.

Environmental studies include comparisons of the performance of genetically similar sheep under conditions at the Center and at other geographic regions of the United States. The effect of season and light on wool production and feed requirements and the reactions of sheep to high temperatures are also being studied.

Animal Fibers.—Wool, mohair, and other animal fibers are analyzed at the Animal Fiber Laboratory to determine the effects of breeding, feeding, and management on the quantity and quality of fiber produced.

Most of the wools used in the research program are individual fleeces from sheep of known genetic origin. The fleece is scoured, carded, and combed; and at various stages during this processing the wool is measured for fineness, length, and variability. The findings are analyzed to determine the extent to which these characteristics can be used in a selective breeding program.

Investigations are underway to develop more adequate tests for evaluating merit of wool particularly for fineness, length, strength, crimp, and density. Instruments are being developed and tested for more rapid, inexpensive, and accurate measurement of wool traits.

Swine Research Branch

Swine research is conducted on an area of about 270 acres at the Center. The plant includes a 28-pen farrowing house, record-of-performance house,

feed barn, and 50 colony houses on individual pastures. One breeding herd totals about 200 hogs, and about 250 litters of pigs are farrowed annually.

Swine-breeding research is directed toward developing and improving methods by which hog raisers can produce most efficiently the kind of pork products most consumers prefer. Since housewives are demanding more lean cuts of pork and less fat, swine producers should raise the kind of meat-type hogs that will meet this demand. Special attention is given to the effects of selection—inbreeding and crossbreeding—on such characteristics as fecundity, viability, rate of growth, feed efficiency, and carcass quality.

In 1934 the U.S. Department of Agriculture imported 23 Landrace and 6 Yorkshire hogs to evaluate their performance in crosses with different domestic breeds. Seven inbred lines possessing varying amounts of Landrace blood were developed from crosses made at the Center. One line, which is of Landrace-Poland China breeding, has attained the status of a pure breed and is now recorded as the Beltsville No. 1 in the Inbred Livestock Registry Association, St. Louis Park, Minn.

To explore the possibility of using hybrid vigor more effectively in producing market hogs, a program of recurrent reciprocal selection similar to that used by corn breeders to increase hybrid corn yields was started at the Center with crosses among three of the Beltsville lines—Landrace, Landrace-Large Black, and Landrace-Poland China—representing the foundation stock for one of the two strains used in this program. The other strain was started from crosses among noninbred purebred stocks of Chester White, Hampshire, and Poland China.

A second breeding experiment with swine now in progress at the Center is concerned with the effectiveness of selection for high and low back-fat thickness.

Research in swine nutrition has been directed into a variety of fields. In vitamin studies, major emphasis has been directed at establishing minimum requirements for gestation and lactation in swine.

In the field of mineral interrelationships, studies have established a definite connection between the zinc and calcium contents of swine diets and the incidence and severity of parakeratosis, including tentative recommendations as to preventive and therapeutic levels of zinc.

A series of tests to evaluate improved processing methods for producing by-product feeds have been primarily directed at the problem of toxicity of cottonseed meal for swine.

Other nutrition research entailing the cooperative efforts of several State experiment stations includes evaluation of cooked garbage as swine feed, a study of the development of the enzyme system in the pig, and investigations to measure the effects of dietary factors on carcass quality of market hogs.

N–21112

Probing back-fat thickness of live hogs electrically (*A*) and with the metal rule (*B*) as a method of identifying superior meat-type hogs.

Crops Research Division

The Crops Research Division, with administrative headquarters at the Plant Industry Station, conducts a program of research designed for the betterment of the Nation's agricultural production. Extensive research studies include field-plot, greenhouse, and laboratory work in plant breeding, genetics, diseases, management and production, and growth—and entail pioneering research in the fields of plant physiology and plant virology. The Division also administers activities concerned with agricultural research in Alaska, Puerto Rico, and the Virgin Islands.

Breeding for more efficient production, adaptation, improved quality, disease and insect resistance, and agronomic characteristics suitable for different regions; and investigations of disease-control methods are significant activities in crop improvement at the Station. Regional performance tests are conducted to evaluate varieties.

The greenhouse facilities often make it possible to grow crop plants under controlled conditions during the winter months and thus speed the development of new varieties. Seeds produced during the winter may be sent to another locality for spring planting. There, seeds for a third crop may be produced. In this way, seeds of successive generations for new varieties may be advanced rapidly and field tested at many locations for further selection. Closely related to activities in the field and greenhouses are controlled and precise experiments conducted in a variety of laboratories. These laboratory experiments are generally concerned with plant growth, plant physiology, biochemistry, and other basic sciences.

The history of crop breeding for resistance to disease shows that varietal improvement is a continuous process that is of major concern in the activities that go on at Beltsville. On one side is Nature's creation of new forms of organisms causing diseases. On the other side is man's constant search for genetic resistance and development of varieties that will resist attacks of disease organisms. To find needed resistance characteristics, it is sometimes necessary to make inoculation or other screening tests on thousands of different strains of plants from all parts of the world. Once the desired plant characteristics are found, the long process begins of crossing and backcrossing to transmit these characteristics to good commercial varieties. An example of this work was the search for resistance to race 15B of wheat stem rust, which involved screening more than 10,000 varieties or strains of wheat.

World collections of seeds are assembled, evaluated, and maintained to discover useful germ plasm and material for use in the development of evolutionary principles. Seeds from these world collections are distributed throughout the country for use in breeding improved varieties. Developing new sources of germ plasm to improve yield and quality of fiber and seed at lower production costs and transferring desired characteristics to commercial strains are an important part of this research.

Experiments are conducted to gain a better understanding of disease-causing organisms and to determine the best cultural and management practices and the effective control of diseases. Date and rate of seeding and fertilizer requirements and tolerances are studied.

The Division, in cooperation with State and Federal agencies, coordinates a national program for the development and distribution of breeder and foundation seeds of the different crop plants.

Research Branch Programs

The Cereal Crops Research Branch conducts research at the Plant Industry Station in the greenhouses, laboratory, and field. Much of the work is seasonal, so the time of a visit to the Station will determine what may be seen. Projects that are active here include genetics and breeding of corn, barley, wheat, oats, and rice; investigations of rusts, mildews, smuts, and other cereal diseases; and operation of World Collections of cereal germ plasm.

A story of long, painstaking work is back of almost every plant breeding achievement. As an example, use of hybrid corn, which was developed only after years of effort by many scientists, has been generally adopted by farmers in this country and is grown today on almost all the acreage planted to corn in the central Corn Belt States.

The Cotton and Cordage Fibers Research Branch conducts research on cotton and cordage fiber breeding, physiology, genetics, quality, and diseases. For obvious reasons, much of the genetics and plant breeding work to produce better varieties of cotton is conducted in cooperation with experiment stations in the cotton-growing areas in the Southern and Western States. Greenhouses at the Plant Industry Station, however, are used to study basic genetic problems. These studies include diverse types of cultivated and wild species.

There are many causes of cotton fiber deterioration prior to harvesting. In cotton-quality laboratory studies at the Plant Industry Station, the nature and causes of such deterioration are investigated, and measures are devised to

Collecting spores of the fungus that causes stem rust of wheat. In the bottom of the collector are many millions of spores, each of which can cause a new infection.

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minimize the damage that occurs in the period between the opening of the bolls and harvesting.

The Forage and Range Research Branch conducts research on alfalfa, clover, special-purpose legumes, and grass with relation to use in forage and range management. Studies are also made of management practices for use of turf grasses on home lawns, military sites, airports, roadsides, recreational areas, and cemeteries.

Management of light is now being studied at the Plant Industry Station. Experiments indicate that forage production may be limited either by light not reaching lower leaves in dense foliage, or by leaves not using all the light available in sparse foliage. By clipping and growth-rate studies in the laboratory, scientists are determining conditions that help plants make more efficient use of light.

An infrared gas analyzer at the Station measures plants' rates of CO_2 uptake from air in a laboratory-controlled system. This approximates the rate of photosynthesis—or growth—of plants being studied.

Of special interest to visitors at the Station are the plots of lawn grasses. Different grass varieties are being evaluated for their winterhardiness, adaptability, and response to fertilizer.

In the Fruit and Nut Crops Research Branch, research is conducted to develop new and improved varieties and kinds of fruits and nuts; to test new methods of pest control; and to study the many basic aspects of fruit-plant growth and development.

In certain of the greenhouses at the Plant Industry Station and on more than 75 acres of the surrounding area are examples of modern fruit science and technology. On adjacent hills and slopes are orchards and plots of experimental plants blooming colorfully in spring and fruit laden in fall. On lower levels are neatly tended vineyards and fields of strawberries and bush fruits. The kinds of fruits grown at the Station are apples, peaches, pears, grapes, strawberries, blueberries, raspberries, and blackberries. Among the nut crops are Chinese chestnut, Persian and black walnuts, and filberts.

Research is conducted to determine the nutrient requirements of the various crops and the soil management and fertilizer practices that will insure these.

The Oilseed and Industrial Crops Research Branch carries out scientific investigations concerned with developing productive varieties of soybean, peanut, flax, safflower, castorbean, and other industrial crops, and other pertinent interests in the field of oilseed and industrial crops research. Investigations on other minor crops—hop, mint, canaigre, sesame, sunflower, and guar—are also conducted. Visitors to Beltsville may see many of these plants grown experimentally in the greenhouses during the winter and in fieldplots during the summer.

The Tobacco and Sugar Crops Research Branch conducts research on sugarcane and sweet sorghum, tobacco, and sugarbeets.

Two-hundred or more imported varieties of sugarcane are grown annually under quarantine at the Plant Industry Station to avoid introduction of foreign diseases and pests. After quarantine, this valuable germ plasm is transferred to sugarcane breeding stations in the United States and in other countries. New selections of sweet sorghum developed in Mississippi and California are evaluated at the Station for resistance to the bacterial stripe disease. Seed stocks of varieties in the World Collection of sweet sorghum are maintained at the Station.

Tobacco research at Beltsville covers a range of studies from breeding new varieties to leaf quality evaluation with radioactive isotopes. Improvements are sought in the use of chemicals for sucker control to eliminate the bad effects on quality of chemicals now in use. Basic studies on the genetics of tobacco are underway, as well as an intensive study on the causative factors in air pollution that injure the crop.

Sugarbeet research is conducted primarily to establish basic breeding material that is resistant to leaf spot and black root. The climatic and soil conditions at Beltsville favor the development of these diseases and thereby facilitate the breeding program. The sugarbeet is not grown commercially in this region.

The Vegetables and Ornamentals Research Branch conducts basic and applied research at the Plant Industry Station to improve the quality and growth of vegetable and ornamental plants, and to determine the causes and control of fungus, bacterial, and virus diseases of these plants.

The hybrid onion industry has grown out of basic genetic studies in onions at

Grass nursery of individual plants from introductions, selections, and irradiation treatments.

Technicians pollinating a temporarily protected peach tree in the orchard during early April. Controlled pollination is a critical step in the development of new varieties.

the Station. Many onion hybrids are now available to growers, and improved carrot varieties are in varying stages of perfection. Many phases of this research can be observed at different seasons at Beltsville.

Varieties such as Tendercrop bean, Roma tomato, and Thaxter lima bean are representative of research results at the Station, in cooperation with State experiment stations.

Mushroom research includes methods of controlling diseases, improvement of natural and artificial composts, and basic studies on genetics and strain improvement. The mushroom research at Beltsville is known internationally.

Two laboratories at the Station doing highly technical and advanced basic research are the Microbiology Laboratory and the Vegetable Seed Investigations Laboratory. The Microbiology Laboratory conducts research on means of controlling soilborne plant diseases through the use of other soil-inhabiting organisms. The Vegetable Seed Investigations Laboratory studies factors involved in seed quality, seed dormancy, and seed development.

Research on ornamental plants has resulted in new varieties of lilies for the domestic bulb industry and the development of new and improved varieties of poinsettias, azaleas, gladiolus, carnations, hollies, chrysanthemums, and dianthus. The use of chemicals to control bud initiation and internode growth in ornamentals has recently been perfected. This research enables the industry to "tailor-make" certain ornamental plants to desired size and to have them flower at any time of the year. At certain seasons of the year the greenhouses are spectacular with these colorful experimental flowers.

The Crops Protection Research Branch is concerned with protecting crops from weed damage, nematodes, and plant diseases; and with developing chemicals that will regulate the growth, development, fruiting, and keeping quality of useful plants. Plant-growth regulators are used commercially to thin fruits; to prevent the dropping of fruits, flowers, and leaves; to stimulate root growth on cuttings; and to check the sprouting of potatoes.

Radioactive tracers have been used to study the means by which regulating chemicals enter the plant, the mechanism of transport through the plant, and the final location in the plant's tissues. The tracers have shown that growth regulators of the 2,4-D type are absorbed by the plant and transferred to the part that is developing most rapidly at the time of application.

Initial development of hybrid onions was perfected at Beltsville under controlled conditions of the greenhouse. Similar improvement is done with several other vegetables.

Evaluating inoculated lima bean seedlings for disease resistance.

Scientist applying a new antibiotic to a diseased bean leaf to determine whether the compound will cure the disease.

New ways of using growth-regulating chemicals are being developed. Possible uses for the future include increasing the resistance of fruit trees and some vegetables to low temperatures and drought. A few chemicals have shown promise in this respect on an experimental basis. Attempts are being made to control chemically the size and shape of some kinds of plants in order to facilitate the use of machines for harvesting these crops. Attempts are being made to find chemicals that will retard the rate of ripening of some kinds of fruit and that will improve the storage quality of some leafy vegetables, such as lettuce, by retarding senescence. A search is being made for more effective gametocides to aid in development of plants with hybrid vigor, and attempts are being made to find chemical means of controlling flower initiation in crop plants.

Besides breeding plants that will resist diseases, chemical methods of controlling diseases are being tested and new ones developed. A special effort is being made to discover chemicals that

can be used to cure plants of some serious diseases. Many antibiotics are being tested and new ones are being developed for this purpose. Basic studies are being made on the absorption, translocation, and metabolism of these chemicals; and methods of using these substances in crop production are being developed.

Chemical weed control studies at the Plant Industry Station include an evaluation of chemicals for their efficiency in preplanting, preemergence, and post emergence sprays for field and horticultural crops; the control of weeds in turf and pastures; and the behavior and persistence of herbicides and other pesticides in soil.

Nematology studies are conducted to find methods of controlling the damage caused by the plant-parasitic nematodes (eelworms). These worms are microscopic in size, often attack the roots of plants, and sometimes attack other parts of plants. Nematodes occur in all the States and damage all kinds of plants, including vegetables on farms and in gardens; field crops; trees in orchards and citrus groves; ornamental plants in nurseries and in home plantings; and forage plants in pastures. An exhibit of nematode damage to plants can be seen in Section 5 of Greenhouse Range No. 2 at the Station.

The National Fungus Collections are one of the largest reference collections of fungi in the world; they contain about three-quarters of a million specimens. The several herbaria comprising it are kept in the North Building of the Plant Industry Station and include the fungus specimens of the Department of Agriculture and the Smithsonian Institution. More than 25,000 species of fungi are included, and about 7,500 species are represented by type material or the equivalent. The collections are used in the taxonomic research of the mycologists of the Department and of others throughout the world. Staff members give particular attention to fungi that cause plant diseases and identify specimens for pathologists of the Department. Mycological information is furnished to scientists and the general public.

The New Crops Research Branch is concerned with searching for and importing promising new plants for specific characteristics; quarantine of foreign introductions; preliminary evaluation of plant introductions at Federal and cooperative introduction centers; and preliminary development of poten-

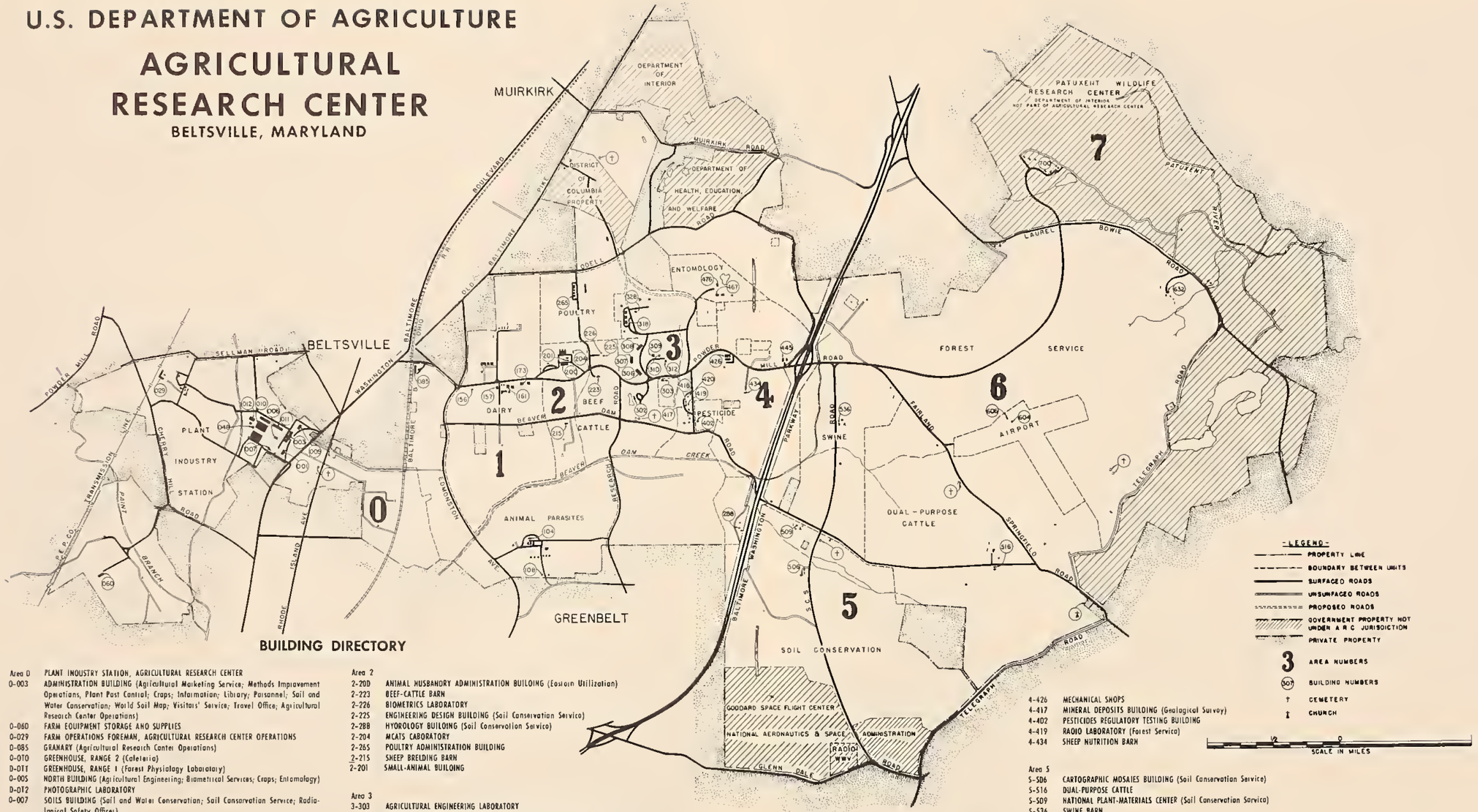
CR-704

A variety of vegetable and field-crop plants grown entirely under artificial light controlled for quality intensity and duration.

U.S. DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH CENTER

BELTSVILLE, MARYLAND



BUILDING DIRECTORY

Area 0
- 0-003 ADMINISTRATION BUILDING (Agricultural Marketing Service; Methods Improvement Operations, Plant Pest Control; Crops; Information; Library; Personnel; Soil and Water Conservation; World Soil Map; Visitors' Service; Travel Office; Agricultural Research Center Operations)
- 0-060 FARM EQUIPMENT STORAGE AND SUPPLIES
- 0-029 FARM OPERATIONS FOREMAN, AGRICULTURAL RESEARCH CENTER OPERATIONS
- 0-085 GRANARY (Agricultural Research Center Operations)
- 0-070 GREENHOUSE, RANGE 2 (Cafeteria)
- D-071 GREENHOUSE, RANGE 1 (Forest Physiology Laboratory)
- 0-005 NORTH BUILDING (Agricultural Engineering; Biometrical Services; Crops; Entomology)
- D-072 PHOTOGRAPHIC LABORATORY
- 0-007 SOILS BUILDING (Soil and Water Conservation; Soil Conservation Service; Radiological Safety Officer)
- 0-001 SOUTH BUILDING (Crops)
- 0-048 STORED PRODUCTS INSECTS BUILDING (Agricultural Marketing Service)
- 0-006 WEST BUILDING (Crops; Agricultural Marketing Service)

Area 1
- T-108 ANIMAL DISEASE AND PARASITE ADMINISTRATION BUILDING
- T-104 BELTSVILLE PARASITOLOGICAL LABORATORY
- T-161 DAIRY ADMINISTRATION BUILDING
- T-173 DAIRY BREEDING AND MANAGEMENT BUILDING
- T-157 DAIRY PRODUCTS LABORATORY (Isotope and Cheese Investigations, Eastern Utilization)
- T-156 U.S. PARK POLICE SUBSTATION

Area 2
- 2-200 ANIMAL HUSBANDRY ADMINISTRATION BUILDING (Eastern Utilization)
- 2-223 BEEF-CATTLE BARN
- 2-226 BIOMETRICS LABORATORY
- 2-225 ENGINEERING DESIGN BUILDING (Soil Conservation Service)
- 2-288 HYDROLOGY BUILDING (Soil Conservation Service)
- 2-204 MCATS LABORATORY
- 2-265 POULTRY ADMINISTRATION BUILDING
- 2-215 SHEEP BREEDING BARN
- 2-201 SMALL-ANIMAL BUILDING

Area 3
- 3-303 AGRICULTURAL ENGINEERING LABORATORY
- 3-309 CARTOGRAPHIC REPRODUCTION BUILDING (Soil Conservation Service)
- 3-307 CENTER LABORATORY (Superintendent's Headquarters, Agricultural Research Center Operations; Clothing and Housing, Nutrition and Consumer-Use; Headquarters Visitors' Service)
- 3-312 FILM STORAGE VAULT
- 3-328 FOOD AND DRUG ADMINISTRATION BUILDING
- 3-302 LOG LODGE (Cafeteria)
- 3-318 MEAT AND POULTRY INSPECTIONS BUILDING (Dairy Herd Improvement Association)
- 3-308 NORTH LABORATORY (Cartographic, Soil Conservation Service; Pesticide Chemicals, Entomology; Human Nutrition, Nutrition and Consumer-Use)
- 3-306 SOUTH LABORATORY (Pesticide Chemicals, Entomology; Grain, Agricultural Marketing Service; Pesticides Regulation, Plant Pest Control; Soil Classification, Soil Conservation Service; Livestock Engineering and Farm Structures, Agricultural Engineering)
- 3-310 WATER-TREATMENT PLANT

Area 4
- 4-420 MARYLAND TECHNICAL OFFICE (Soil Conservation Service)
- 4-445 AUTOMOTIVE SHOPS
- 4-418 CARTOGRAPHIC NORTHEAST STATION (Soil Conservation Service)
- 4-476 ENTOMOLOGY LABORATORY "A" (Insect Pathology)
- 4-467 ENTOMOLOGY LABORATORY "C" (Insect Physiology, Entomology; Forest Insect Laboratory, Forest Service)
- 4-426 MECHANICAL SHOPS
- 4-417 MINERAL DEPOSITS BUILDING (Geological Survey)
- 4-402 PESTICIDES REGULATORY TESTING BUILDING
- 4-419 RADIO LABORATORY (Forest Service)
- 4-434 SHEEP NUTRITION BARN

Area 5
- S-506 CARTOGRAPHIC MOSAICS BUILDING (Soil Conservation Service)
- S-516 DUAL-PURPOSE CATTLE
- S-509 NATIONAL PLANT-MATERIALS CENTER (Soil Conservation Service)
- S-536 SWINE BARN

Area 6
- 6-604 AIRPLANE HANGAR (Methods Improvement Operations, Plant Pest Control)
- 6-606 AIRPLANE HANGAR (Forest Insects)
- 6-632 FOREST DISEASE LABORATORY

OTHER GOVERNMENT AGENCIES

Area 5
- GODDARD SPACE FLIGHT CENTER (National Aeronautics and Space Administration)
- RADIO STATION WWV (U.S. Department of Commerce)

Area 6
- U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Area 7
- PATUXENT WILDLIFE RESEARCH CENTER (U.S. Department of the Interior)

tially new crops for production in the United States. Plant names are identified and reviewed, and inventories of plant materials introduced for research purposes are maintained.

Surveys of the world's plant resources are collated with the needs of industry and agriculture for new raw materials that can be supplied by new or improved crops for the United States. Promising new crops are evaluated and increased after chemical and industrial assessment. Acclimatization studies of new plants selected as having high agronomic and utilization potential are made to determine soil and climatic requirements.

Pioneering Research Laboratories

The Plant Physiology Pioneering Research Laboratory was established to study the effects of light and temperature on plants. Such problems as flowering and fruiting; dormancy of buds, bulbs, seeds, spores, or other organs; and growth of trees and herbaceous plants are being studied. The effect of length of day and night on the growth and flowering of plants is being studied in greenhouses and in special chambers equipped to provide light or darkness as desired. The studies include tests under certain controlled environments of different wavelengths, or colors, of the visible spectrum.

Length of night affects plant growth more than does length of day. Red light stimulates growth of some plants. Far-red, the barely visible radiation on the edge of the spectrum, and infrared undo the effect of red light. As this knowledge increases, light is used experimentally to regulate flowering; seed germination; coloring of tomato skins; and growth of bulbs, roots, and seedlings.

The Plant Virology Pioneering Research Laboratory was established to determine what happens after a plant virus particle enters a host, how it multiplies, what the response of the host is to the virus, and how plant viruses are related. A more basic understanding of the relationship of the viruses to their plant hosts is needed to help solve many complicated disease problems of crop plants. These laboratories contain much specialized equipment, such as the ultracentrifuge and the electron microscope.

National Arboretum

The Crops Research Division directs tree-, shrub-, and other plant-research activities at the National Arboretum, which is located at 28th and M Streets, NE. in the District of Columbia. The Arboretum is nationally known for its many excellent collections of woody plants such as azaleas, camellias, hollies, crab apples, and conifers, which are most spectacular in seasons of growth and flowering.

Entomology Research Division

The function of the Entomology Research Division, which has its headquarters at the Plant Industry Station, is to protect man, animals, and plants from the attacks of harmful insects and to increase the usefulness of beneficial insects. Entomologists in laboratories and offices at the Agricultural Research Center study problems in these fields and supervise the activities of about 100 entomology research laboratories located throughout the United States. Only a small part of Federal research in entomology is conducted at the Center.

Apiculture

The Apiculture Research Branch maintains a laboratory at the Center for research on the biology and control of diseases and pests of the honey bee. Bee diseases cause loss of colonies, reduced honey production, depletion of bee populations needed for crop pollination, and expenditures by beekeepers and by States to control diseases. The laboratory develops practical and economical methods for controlling bee diseases and pests and provides a diagnostic service for beekeepers and State apiary inspectors. Included in this work is the screening of experimental insecticides for their relative toxicity to honey bees. A colony of honey bees is maintained in a glass observation hive for the benefit of visitors.

Thousands of requests for information and publications on various aspects of bee culture are received at the laboratory each year from all parts of the United States and from foreign countries.

The Bee Culture Branch of the National Agricultural Library is housed at the laboratory. It contains thousands of books on bee culture and one of the most extensive bibliographies in the world on this subject.

Pioneering Research on Entomological Problems

Basic studies to develop helpful facts and background information on insects and related problems are carried on in the Pioneering Research laboratories. Unburdened by specific assignments, scientists in these laboratories search for fundamental facts that are needed by entomologists in the development of practical ways to control destructive insects.

The Insect Physiology Laboratory conducts basic research on the biochemistry and physiology of insects, including the mode of action and metabolism of insecticides. This program is necessarily varied and flexible. Physiological research now in progress concerns insect nutrition, reproduction, and utilization and metabolism of essential nutrients. Studies on insecticides are aimed at gaining a better understanding of their toxic action and of the mechanisms of insect resistance to insecticides.

A more thorough knowledge of the life processes of insects should lead to the exploitation of certain unique physiological or biochemical features to disrupt insect growth, metamorphosis, and reproduction. In addition, such research on insects will add to the knowledge of comparative physiology and lead to an improved understanding of the nature of these processes in higher animals. Just as information from other

fields is used in this laboratory, knowledge of insect physiology is useful in medicine, biochemistry, and many other sciences.

In the Insect Pathology Laboratory, basic studies are conducted on the mode of action and growth requirements of pathogenic viruses, bacteria, fungi, protozoa, and nematodes that attack insects. Methods of using these organisms to control harmful insects are also studied.

A diagnostic service is maintained for field stations of the Division, State experiment stations, and other agencies interested in determining the diseases of insect pests. Research is also conducted in mass culturing and artificial dissemination of bacterial, fungus, and virus-disease organisms for economic control of many insect pests.

Finding More Effective Insect Control Chemicals

Much entomological research pertains to chemicals for insect control and methods of applying them. The Pesticide Chemicals Research Branch conducts research to find new materials that will reduce residue hazards and effectively control insects that have become resistant to insecticides. New organic compounds made by chemists or supplied by industry are tested and then investigated at field stations.

TC–5459

Applying insecticides in aerosols on greenhouse tomatoes.

BC–1

Bee behavior is studied in glass observation hive.

Chemicals produced by plants are also tested for value in insect control. For example, the structure of the pyrethrins, the active principles of pyrethrum flowers, has been worked out, and allethrin, a compound similar to one of the major components, has been synthesized. Allethrin is now in commercial production.

Compounds that may act as repellents and attractants to insects are synthesized for testing by entomologists. The highly effective insect repellent diethyltoluamide was developed in this manner. Attractants used in insect surveys and control programs have resulted from this work. The chemistry of substances naturally occurring in insects is being investigated as a source of attractants.

N–27826

Chemist sorts punchcards for information to guide him in the synthesis of new insect attractants.

The principle of applying insecticides by means of the aerosol bomb was developed by scientists at the Center during World War II to help control insect-borne diseases. Aerosols have been of great commercial value for the dispersal of insecticides in greenhouses to control insects attacking flowers such as roses, chrysanthemums, and carnations, and vegetable crops such as tomatoes and cucumbers. They are also widely used in the control of household pests. Research to develop improved aerosol formulations and equipment is carried on at the Center.

Extensive airplane travel has greatly increased the hazard of accidental spread of harmful insects. Aerosol formulations have been developed to eliminate insects in airplanes while in flight. Residual insecticides that are effective for some length of time are also used in baggage and mail compartments of aircraft.

Physical properties of insecticide formulations are studied in relation to efficiency of application and effectiveness in insect control. The data obtained are needed by entomologists and the insecticide industry.

Methods have been devised to analyze and determine insecticide residues on fruits, vegetables, and forage crops. The results of these residue analyses are used to adjust insecticide applications, so that the residues will conform to the official tolerances established under Public Law 518, the Miller amendment to the Federal Food, Drug, and Cosmetic Act.

Thousands of test insects such as mosquitoes, flies, and cockroaches are reared under rigidly controlled conditions at the Center. Special strains are perpetuated and exchanged with other laboratories, so that results of tests conducted at the Center or elsewhere may be compared accurately.

Controlling Insects of Garden and Greenhouse

The Fruit and Vegetable Insects Research Branch conducts research at the Center on the chemical and biological control of insects of flowers and vegetables in the garden and in the greenhouse. Studies are underway with both

conventional and systemic insecticides. The laboratory has recently been equipped with a small cobalt 60 unit for exploratory studies of the effects on insects of irradiation by gamma rays.

Insect contamination in processed fruits and vegetables causes heavy losses to processors and growers. Research is conducted to develop control of insects in the field in order to avoid such contamination.

Part of the work concerns studies of insecticide residues on vegetables. Samples of the crop are harvested at various intervals after treatment with different insecticides and taken promptly to chemists for analysis of residues. The information thus obtained is used to determine the waiting periods necessary between the application of insecticides and the harvest of vegetables.

Laboratory studies by this Branch have shown that some strains of spider mites have become highly resistant to miticides. When these resistant mites mate with nonresistant mites, the offspring inherits the high resistance from either the male or female parent. New chemicals reputed to kill mites are tested in the laboratory against resistant mites in efforts to find new effective materials where older ones are no longer satisfactory.

This Branch is also conducting studies in cooperation with the Crops Research Division to determine the insects that transmit virus diseases to chrysanthemums, gladiolus, carnations, lilies, and other greenhouse flowers; also to sweetpotatoes, lettuce, strawberries, and other vegetables and fruits.

Controlling the Alfalfa Weevil

The Grain and Forage Insects Research Branch conducts research at the Center on the alfalfa weevil and methods for its control. Tests are made to find safe, effective insecticides; and imported parasites of the weevil are liberated in the field and checked for establishment. In cooperation with the Crops Research Division, selections and varieties of alfalfa are evaluated for resistance to the weevil. The goal of these studies is to develop a weevil-resistant alfalfa.

Insect Vectors of Animal Diseases

Livestock is afflicted by several diseases known or thought to be transmitted by arthropods. Research is conducted at the Center by the Insects Affecting Man and Animals Research Branch in cooperation with the Animal Disease and Parasite Research Division to determine the role of insects and ticks in the transmission of certain diseases. Several species of insects and ticks are being studied as possible vectors of anaplasmosis, a serious disease of cattle.

N–2487

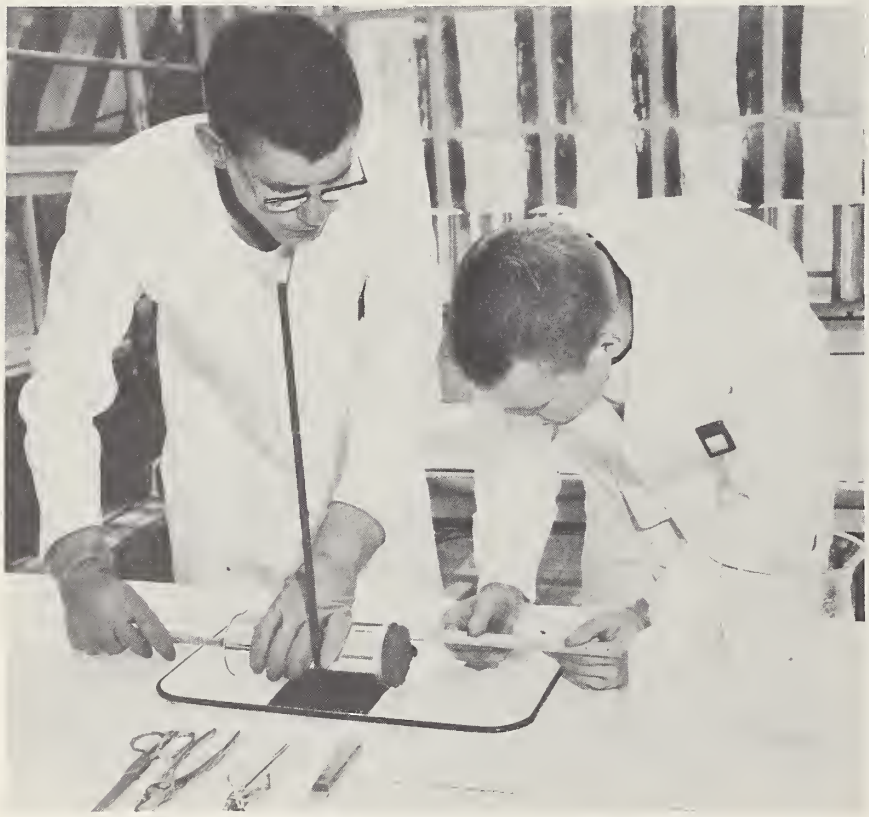
A cockroach is dissected to find out how insecticides kill.

Conservation farming means managing every acre according to its individual soil management requirements and using every acre to the extent of its individual capabilities. Headquarters for research on soil and water management and watershed engineering are maintained at the Agricultural Research Center. However, most of the investigations on these and other phases of soil and water conservation research are conducted at field stations in cooperation with State experiment stations and other agencies. Investigations of fertilizer technology and much of the basic research on soils and mineral nutrition are conducted at the Center. Mathematical models for watershed engineering are developed here also.

U.S. Soils Laboratory

This Laboratory at the Plant Industry Station serves as a center for fundamental research on soil-water-plant relationships. Scientists conduct investigations on micro-organisms capable of fixing atmospheric nitrogen, including the possibility of genetic transfer by transduction; and they study relationships of soil organisms to soil tilth and plant nutrition. Factors and principles pertaining to decay of plant materials, formation of humus, and other biological transformations in soils are studied. Fundamental investigations also are made of the chemistry of nutrient elements in soils and their availability to plants, including soil acidity and toxic factors in acid soils. Methods for soil and plant analyses, including spectrochemical analysis, are developed and tested.

The chemistry of pesticides and radioactive contaminants as they are related to soil characteristics is being studied. The behavior of radioactive fission products, principally strontium 90, in different soils; the amount of radioactive material removed from the soil by erosion or leaching; and the factors that control the uptake and translocation of strontium 90 in plants are studied. Basic information is needed for planning the decontamination and use of agricultural areas contaminated with fallout materials. Another phase of this research, conducted cooperatively with the Agricultural Engineering Research Division, consists of studies on the mechanical removal of radioactive contaminants from the soil. All radioactive fission products research is conducted in cooperation with the Atomic Energy Commission.



PN–585

Sectioning a soil column to determine how far a radioactive isotope has moved after leaching with water. More soil columns can be seen in the background.

Mineral Nutrition Pioneering Research Laboratory

Pioneering research in the field of plant nutrition is conducted by scientists who study the processes by which plants take up nutrients; how the nutrients function in plants; and how mineral nutrition is related to the environment of the plant and the complex process of

growth. The purpose of the laboratory is to develop a better understanding of life processes in plants, especially the role of mineral nutrients. Laboratory findings provide a scientific basis for workers to use in attacking the practical problems of soil fertility and crop production.

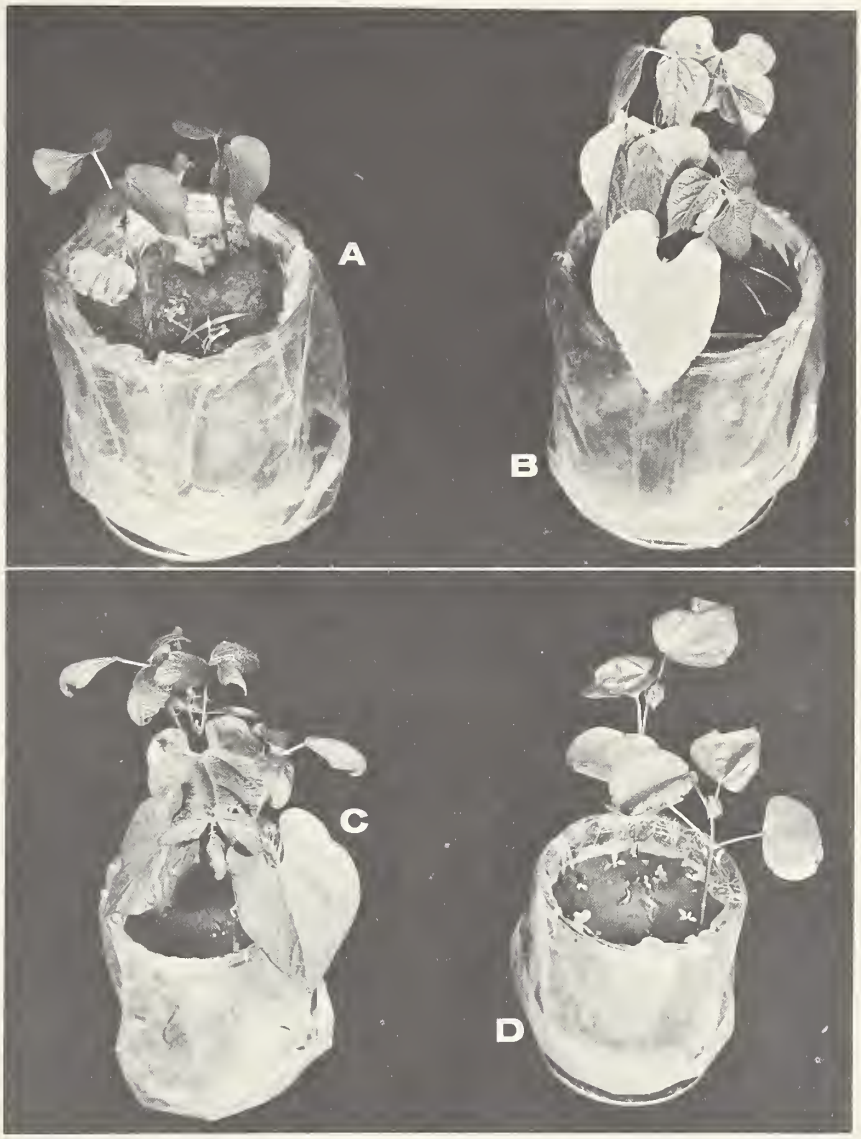
U.S. Fertilizer Laboratory

The composition and manufacture of nitrogen, phosphate, and potash fertilizers; liming materials; and soil amendments and ways to make them more efficient and more widely available are being studied in laboratories and greenhouses. Methods are also sought for improving the manufacture, packaging, and storage properties of high analysis fertilizers.

Methods and standards for analyzing fertilizers and liming materials are developed cooperatively; and data on resources, supplies, production, and consumption of such materials are gathered. These studies point up present and needed developments in commercial fertilizer manufacture and use.

U.S. Hydrograph Laboratory

Data analyses are conducted in the Hydrograph Laboratory to develop and test new ideas and techniques in watershed engineering, to obtain the maximum use of soil and water resources. Information on rainfall, hydraulics of flow, geology, soils, vegetation, and hydrology is assembled and studied by highly specialized scientists. Located at Plant Industry Station, the Laboratory maintains working relations with various agencies and institutions throughout the Nation that are involved in problems of flood abatement, water yield, or soil conservation.



Liming according to the soil and crop requirements should result from studies of factors that limit growth on acid soils. Aluminum toxicity to cotton and to snap beans growing on Bladen soil pH 4.5 is shown by plants *A* and *B*, respectively. Manganese toxicity to snap beans and to cotton growing on Centerton soil pH 4.9 is shown by plants *C* and *D*, respectively.

Nutrition and Consumer-Use Research

Clothing and Housing Research Division

The Clothing and Housing Research Division and the Human Nutrition Research Division study the usefulness and economy of fabrics, foods, and other goods and services from the standpoint of the consumer. From the research of these divisions come facts to help the 53 million or more households of the Nation achieve better living through more effective management of their resources. In addition to work done in the laboratories at the Agricultural Research Center, other research and the servicing of an interagency committee on nutrition problems are performed in the Washington offices by the Consumer and Food Economics Research Division. Investigations are also carried on either cooperatively or by contract in almost every State.

Evaluating Textiles for Serviceability

Clothing and textile research aids consumers by providing practical information that will help them decide what types and qualities of materials and workmanship are best suited to their needs. To get this information, fabrics differing in fiber content, finish, and construction are studied in the laboratory under controlled conditions of temperature and humidity. Here, instruments are used to measure breaking, bursting, and tearing strengths; resistance to abrasion and to wrinkling; air permeability; shrinkage; colorfastness; and other characteristics of fabrics. Methods of constructions used in clothing and household textiles are also investigated. For example, studies are underway on the effects of stitch length, type of seam finish, and type of sewing thread on the appearance and durability of seams in cotton fabrics of various types and finishes.

In-service tests add to what laboratory tests reveal about the usefulness of fabrics for specific uses. These tests also help to show which laboratory tests are most helpful in predicting performance in use. Among the textiles so studied are knit fabrics of various types and fibers, men's suitings of wool or wool blends, cotton shirtings, and cotton rugs with and without soil-retardant finishes.

PN–903 & N–26086

(*Left*) A dress designed with hidden waistline pleats that open as the arm is raised and close when it is lowered. Dress is beltless for convenience and has an elasticized back. (*Right*) A waterproofed fabric is used in this apron designed to fit the lap as a homemaker sits to work. A corded rim and a plastic waist clip are other features.

Developing Recommendations for Fabric Care

Other clothing and textile research leads to improved methods for home care of clothing and household textiles. Chemists are finding out what concentrations and types of detergents, bleaches, and whiteners are best for fabrics with special finishes and for those made of the newer fibers. They are trying to find the causes of yellowing of white cotton fabrics, and ways of preventing it. Bacteriologists are developing home-use methods for preventing the transmission of disease-producing organisms by clothing and household textiles. Their work includes a study of the survival of bacteria on fabrics and the effectiveness of compounds sold for the purpose of disinfecting or rendering fabrics bacteriostatic.

Developing Functional Clothing

Clothing suited to the special needs of homemakers—normal or handicapped—contributes to homemaking efficiency. To determine these needs,

specialists go directly to the homemakers. A case study of clothing problems and needs of physically handicapped homemakers showed that, although handicaps differ, clothing problems are similar. Garments were developed with features that provide for such needs as comfort, safety, convenience, and freedom to make full use of physical capabilities.

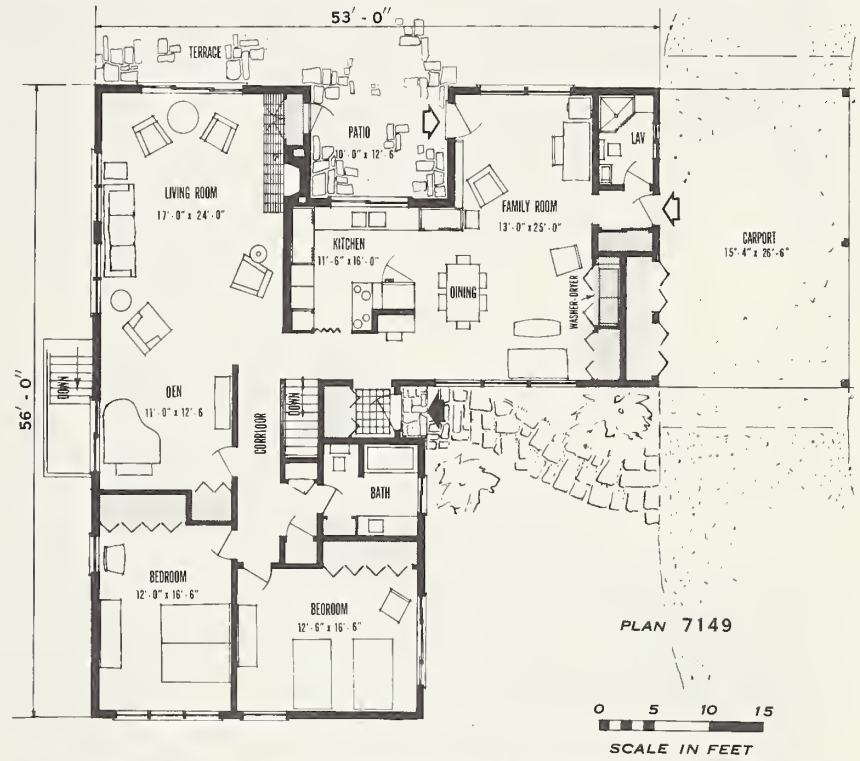
Results of the research on functional clothing were published by the Department and are available to homemakers, leaders who train the physically handicapped to resume their jobs as homemakers, and manufacturers who may be interested in applying the research findings. Loan collections of the garments are available to professional organizations, including occupational and physical therapists; rehabilitation counselors; physicians; nurses; health and social workers; and home economists.

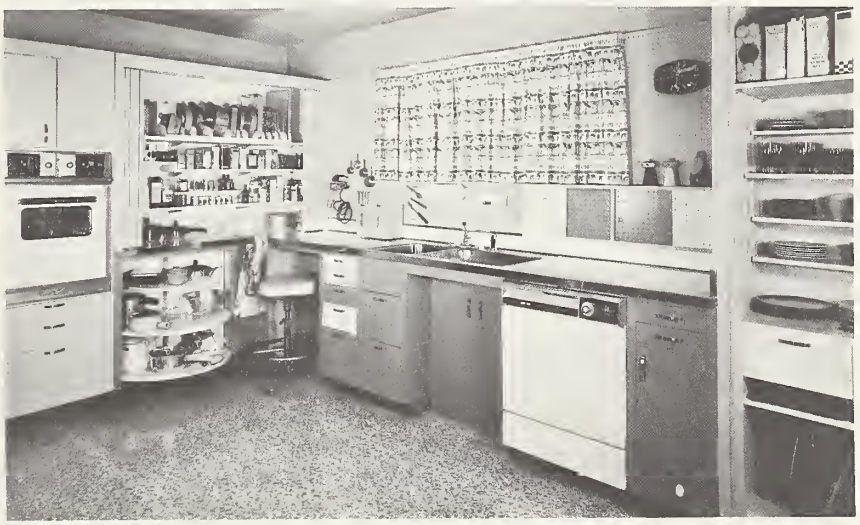
Designing Functional Houses

Space dimensions and arrangements for household activities and storage areas that meet rural families' needs and that consider the energy expended in carrying out household activities are major subjects of housing research. USDA's housing specialists join forces with those in universities and experiment stations for much of this work. For example, USDA specialists studied the space required for canning and freezing foods and that needed for storing household linens. State specialists studied the space needed for baking, sewing, and laundering. Thus, to determine the space needed around furniture and equipment for effective use and care, Federal and State specialists worked together on measuring the space used by large numbers of women in performing household tasks.

Research is also being done to compare the energy costs of using equipment and storage facilities of different designs and arrangements, different types of equipment, and different methods of work. Findings of this research, together with that on space requirements, are used in designing energy-saving and efficient arrangements for work and storage spaces for the various areas of the house.

Housing specialists and staff architects work with architects of the Agricultural Engineering Research Division in developing new farmhouse plans for distribution through the Cooperative Farm Building Plan Exchange, which the Department conducts cooperatively with State agricultural universities. State universities then supply the working drawings and plans to farm families.





DN—1707

Farmhouse plan that has been developed around the energy-saving kitchen design shown. Research findings on energy expended for various household tasks and on space needs for housework and storage have been incorporated throughout the house plan.

USDA publications are available that set forth principles of design useful in planning various parts of the house and that illustrate efficient layouts of space and equipment.

Equipment Performance

Research on household equipment gives information on the performance of different designs of equipment. Thus it assists families in selecting designs that meet their needs. The facts obtained are presented in bulletins to guide consumers in the use and care of their equipment, to help manufacturers improve design of equipment to meet more nearly the needs of homemakers, and to provide teaching aids for educational and other groups working in the equipment fields.

As an example of this type of research, modern equipment was used for laundering some of the newer types of fabrics on the market to find out how washing machines and dryers can be used most satisfactorily with each fabric. Other studies are being conducted on mechanical dishwashers, on proper temperatures for hand iron soleplates, and on the performance and space requirements of portable electric cooking appliances.

Household Water Requirements

The study of water requirements for farm household operations, now underway, is coordinated with a parallel study by the Agricultural Engineering Research Division on farmstead water requirements. Results will provide families with a factual basis for planning their farm water systems and for selecting appropriate equipment and appliances.

Human Nutrition Research Division

Evaluating Food Quality

Basic principles of cooking are investigated to discover the effects of different methods of preparation on the eating quality, yield, nutritive value, and safety of foods of different market qualities. Improved food-preparation and food-preservation procedures are developed for use in homes, school-lunch programs, and institutions.

Eating quality largely determines consumer acceptance of many foods. Studies are being made to determine the relationship of color, texture, acidity, sugar content, and other physical and chemical properties of fresh and frozen fruits to eating quality after home preparation or preservation. Another investigation is concerned with baked products. Household shortenings have changed markedly in the past 10 years because of modern processing. This change affects the amount of fats or oil used in a baked product and, in turn, the proportions of other ingredients (sugars, eggs, liquids) needed. From this study will come new formulas and procedures for baked products that take into account the changing nature of these basic commodities.

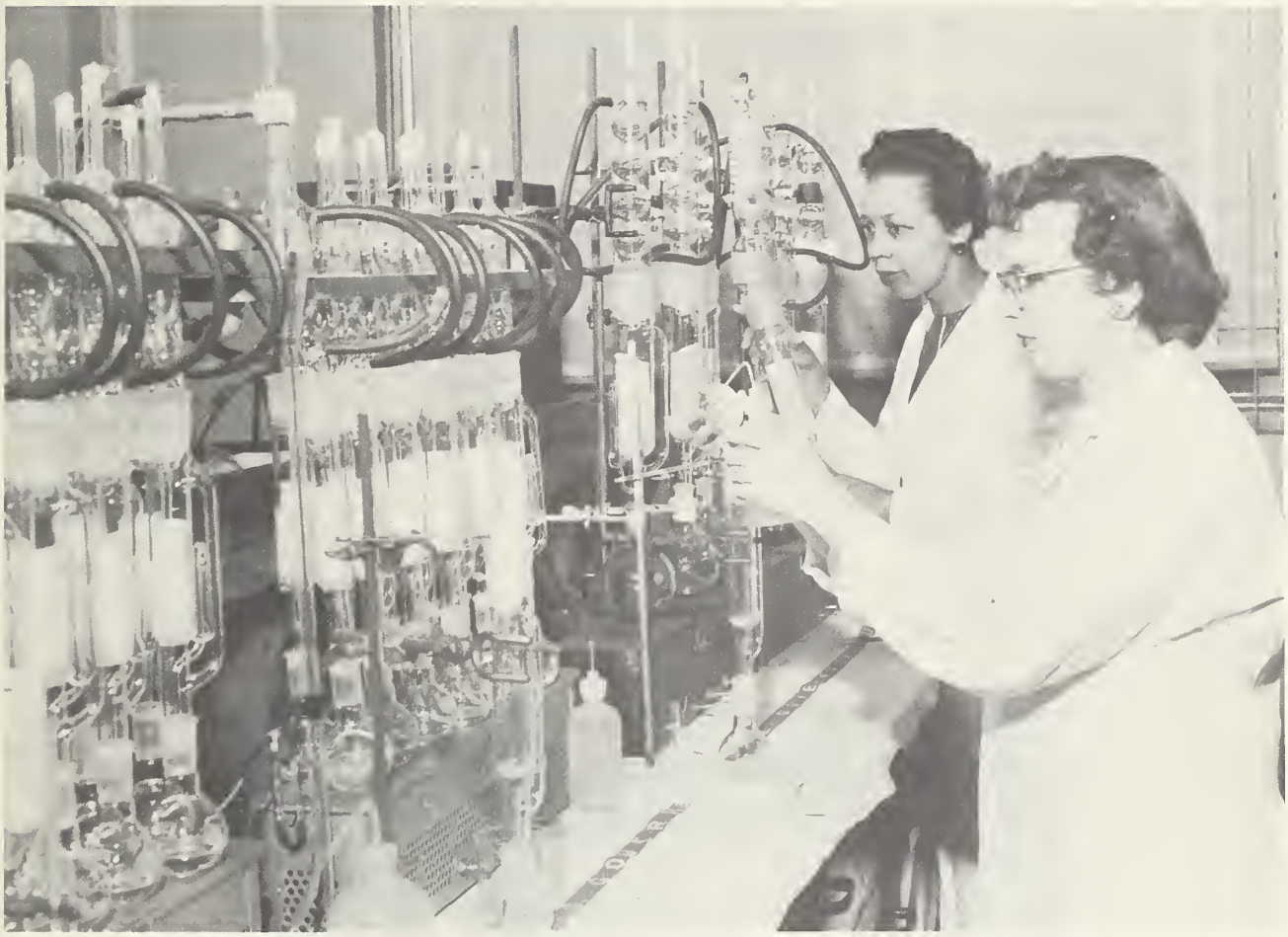
DN–1668

Color is one criterion used to evaluate cooking procedures for many goods. Here the color of chicken cooked by different methods is being measured.

Studies to determine the effect of age, breed, feed, or processing on the cooking quality, yield, and nutritive value of certain meats and poultry are also underway in cooperation with production and marketing agencies.

Another phase of food-quality research deals with many foods—vegetables, fruits, and meats—that have been exposed to various insecticides during production. In cooperation with other Department agencies, scientists are attempting to measure flavor, odor, and general acceptability of these foods in relation to experimental insecticide treatments.

To help in the National School-Lunch Program, recipes utilizing abundant foods have been developed and standardized. A basic card file of these



N–33251

One type of equipment used to determine nutritive content of foods. The Soxhlet apparatus determines by ether extraction the amount of fat in raw foods or in foods as prepared for eating.

recipes, including soups, salads, vegetables, main dishes, breads, sandwiches, desserts, and sauces, has been published. As new recipes are developed, supplements to this file are issued and distributed to schools cooperating in the National School-Lunch Program. A buying guide was also developed to help supervisors and cooks estimate the amount of a commodity to buy in order to provide the quantities specified.

Determining Food Values

Research is in progress continuously to determine the amounts and the kinds of nutrients in foods when they are bought and when they are prepared for eating. Data from the U.S. Department of Agriculture and many laboratories are summarized and published to meet the numerous requests for reference tables on the nutritive value of foods.

The protein value of a food is determined not only by its protein content but also by how much of each essential amino acid is present in the protein and by how much is available to the body. Methods have been developed and applied to determine the amount of the many amino acids present and the extent to which they are probably utilized in body processes. Studies are also made to find out how different kinds of cooking alter the availability of amino acids in high-protein foods such as meat, milk, beans, peanuts, soybeans, and cottonseed.

Fats contribute more than twice the energy value per gram that proteins or carbohydrates do; they constitute about 40 percent of the calories of the average American diet. In addition, fats furnish small amounts of nutritionally essential fatty acids such as linoleic acid, long recognized as an "essential" fatty acid and now the center of much attention in nutrition research. Research is providing data on the fatty acid content of selected foods and on the effects of cooking on various fatty acids.

Many mineral elements are known to be essential in human nutrition. But figures now available on important minerals such as calcium, sodium, phosphorus, and iron refer to foods as produced and marketed 40 or more years ago. Studies are presently being made with several fruits and vegetables widely consumed in this country to determine their mineral content and possible dif-

ferences in foods produced in different parts of the country and in different growing seasons.

Water-soluble B-vitamins are necessary for growth, activity, and reproduction. Assay procedures for thiamine, riboflavin, and niacin have been standardized. More recently, assay procedures for some of the newer members of the B-vitamin family, namely folic acid, pantothenic acid, and vitamin B_{12}, were perfected and their distribution in foods determined. Research now is directed toward developing dependable methods for microbiological assay of another nutritionally important B-vitamin, B_6, which appears in foods in three forms—pyridoxine, pyridoxamine, and pyridoxal.

Research is providing more complete and more exact knowledge about the nutritive value of foods and how effectively nutrients are utilized by the human body. This information will help those planning diets to insure adequacy in the important nutrients.

Studying Human Nutritional Needs

Amounts of many important nutrients needed by the body are not known; others are known only within broad limits. There is little precise information on the kinds and quantities needed by individuals of different age, activity, and environment. A great deal remains to be learned also about the comparative effect on health of different combinations of foods and nutrients. In the nutrition laboratories of the Department of Agriculture, research with rats and with human subjects is helping to fill some of these gaps in knowledge.

For example, fatty acids, particularly those believed to be nutritionally important, are being incorporated in diets to determine the amounts and kinds needed to maintain health and well-being. Other studies are underway to determine the effect of different kinds of dietary fats on the growth and longevity of experimental animals. Such studies provide information that will help in planning research with human subjects.

Chemists, biochemists, nutritionists, and allied scientists are teaming up to study the manner in which the utilization of various types of fats is influenced by different dietary proteins, carbohydrates, and vitamins. From all these investigations, a better understanding of human requirements for these and other constitutents is emerging.

N–33259

Among measures used in nutrition research to determine the response of animals to experimental diets are detailed weekly records of food intake and of body weight.

Regulatory Programs

Animal Disease Eradication Division

The Animal Disease Eradication Division maintains serological testing laboratories at the Agricultural Research Center for diagnosis of noninfectious animal diseases classified as noncommunicable to man. An identification and classification service on external parasites is maintained, and eradication programs are underway.

Chemical analyses are made on cresylic disinfectants and dips permitted for official eradication projects, as provided in the Code of Federal Regulations.

Pesticides Regulation Division

The Pesticides Regulation Division administers the Federal Insecticide, Fungicide, and Rodenticide Act of June 25, 1947, as amended August 1959. This Act requires products to be properly labeled and registered with the U.S. Department of Agriculture prior to being moved in interstate commerce. The law is intended to protect farmers, livestock raisers, orchardists, and householders from losses and possible personal injury through faulty, misbranded, or adulterated products. The Pesticides Regulation Division collects samples from interstate shipments of commercial insecticides, fungicides, disinfectants, rodenticides, weedkillers, nematocides, defoliants, desiccants, and plant regulators; analyzes them chemically; and tests them in laboratories, greenhouses, gardens, and orchards located at the Agricultural Research Center. The Division also carries out certain responsibilities pertaining to the Pesticide Chemicals Amendment of the Food, Drug, and Cosmetic Act.

Plant Pest Control Division

The Plant Pest Control Division's Methods Improvement Operations staff has headquarters at the Plant Industry Station and a hangar and shops at the Center airport. This staff serves the Division by establishing and maintaining liaison with research personnel of the Center and with other Federal, State, and industry groups. It supervises the testing of promising research results on a field basis and recommends materials, equipment, and methods for use in large-scale field operations. Technical supervision of the Division's aerial application activities is directed from this office and includes preparation of aircraft specifications, application techniques, and specification of pilot qualifications.

Plant Pest Control Division airplane used for test applications of new pesticides.

Utilization Research and Development

Eastern Utilization Research and Development Division

Meat Research

This Division, which has its headquarters at Wyndmoor, Pa., maintains laboratories at the Center for research on the chemistry and microbiology of meat and meat products. The object of the work is to devise better methods of processing and preservation and to increase our knowledge of meat composition and characteristics.

To carry out this objective, facilities are maintained that include laboratories for chemical and microbiological research and pilot-plant equipment for freezing and curing meat and for sausage manufacture. Special rooms provide almost every desired condition, such as controlled temperature (including freezing at 90° F. below zero), humidity, and air circulation. Meat technologists working with an air-conditioned smokehouse, prepare and study a wide variety of products under practical conditions.

Problems under investigation are varied. Members of the staff separate meat into its component flavorful constituents by novel techniques and by using specially designed apparatus. Others study meat proteins by means of modern instruments and equipment and describe the protein characteristics. Both chemical and microbiological studies of fat oxidation and rancidity of meat and the relation of bacteria to meat flavor are studied. Chemical and physical properties of meat that are important in maintaining quality in processed meat are also studied. An extensive collection of cultures of micro-organisms isolated from meat is maintained.

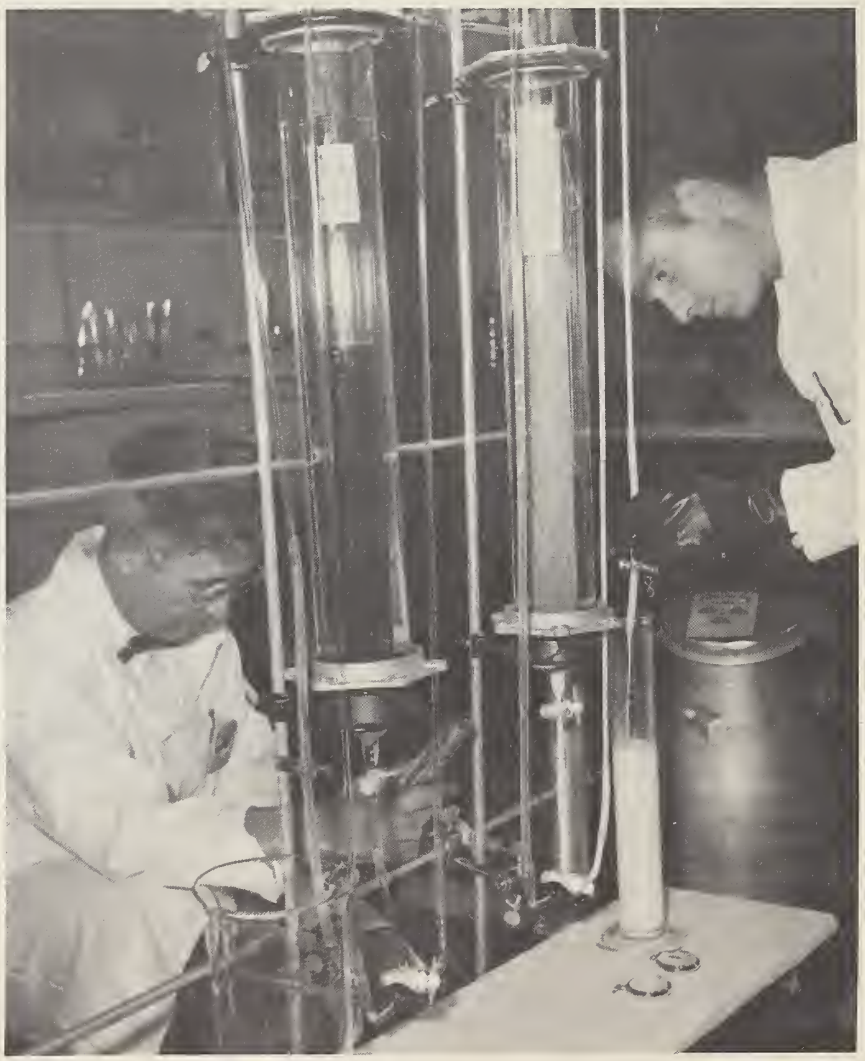
Cheese Research

Research to develop cheesemaking procedures that will improve flavor and uniformity is being carried on at the Center. Experimental cheese is made on a pilot-plant scale. All the steps in cheesemaking—from pasteurizing and curdling the milk through cooking, milling, and pressing the curd—and in curing are carried on with commercial-type equipment or equipment made especially for experimental work. Effects of different kinds and combinations of bacterial starters and enzymes on quality and flavor of Cheddar cheese are under study.

Recently, a method was developed for making high-grade Cheddar-type cheese with much less labor than formerly.

Isotope Removal

Research is being conducted in cooperation with the U.S. Atomic Energy Commission and the U.S. Public Health Service to develop a feasible process for removing radioactive contamination from milk without significantly changing its flavor, nutritive value, or physical appearance. Laboratory and pilot-plant studies have shown that ion exchange resins are highly effective in achieving these goals.



Removing radioactive isotopes from milk with ion exchange resins. (Public Health Service photograph.)

AGRICULTURAL MARKETING SERVICE

Market Quality Research Division

The Market Quality Research Division conducts part of its research at the Plant Industry Station. This work, done by physical and biological scientists, is designed to maintain and improve the market quality of food, feed, and fiber from farm to consumer. It is also concerned with finding out what quality is and how to measure it objectively. The Division is also responsible for the control of insects that infest agricultural products in farm and commercial storage, during transit, in processing plants, and in packages in the home.

Horticultural Crops Branch

Most fruits and vegetables are highly perishable. This means that environmental conditions must be carefully controlled in marketing channels if consumers are to receive good quality, nutritious products, and farmers are to receive top prices for their products. Research on the best environment for each product is the responsibility of the Horticultural Crops Branch. Scientists in this Branch make recommendations on proper storage and transit temperatures for fruits and vegetables. They study correct refrigeration methods and equipment, humidity, and other atmospheric conditions in marketing channels. Market quality is also affected by the types of packaging used, the chemicals that are applied to prevent scald or decay, and a variety of marketing diseases that result in quality disorders.

Research has shown growers of Golden Delicious apples how to extend the market life of their product by use of polyethylene liners. It has resulted in developing ways to maintain quality for longer periods of time and to remove field heat more quickly from lettuce, peaches, corn, and a variety of other products by hydrocooling and vacuum cooling. Marketing research by the Horticultural Crops Branch has resulted in (1) improved transit protection procedures for Pacific Northwest pears that control ripening and thus lengthen the marketing season; (2) heavier loading for potatoes that cuts transit cost without damaging the product; (3) use of cherry lug liners that keep the fruit in better condition; and (4) controlled storage environments that keep the product in good condition and help retain its vitamins.

Field Crops and Animal Products Branch

Each agricultural product has quality problems all its own. For example, the development of mechanical cotton harvesting has necessitated additional drying and cleaning at the gin. This, in turn, has affected cotton spinning performance. If grain inspection is to be improved, better sampling equipment must be devised and instruments must be designed that will measure quality more objectively and at less cost. Marketing research in the Field Crops and Animal Products Branch on grains, oilseeds, fibers, seeds, dairy products, poultry, and livestock quality has provided solutions to some of these problems. Work on others is continuing.

A new low-level radiation counter is being used by marketing scientists to determine the fat and lean content of beef, pork, and poultry. A new method has been developed to detect cracked seedcoats of small seeds and beans by using a chemical stain. New equipment developed and tested by marketing researchers shells, counts, and splits peanuts for grading purposes much faster and more accurately than do humans.

Stored Products Insects Branch

Insects that infest agricultural crops in the field represent only one facet of the insect problem. Many insects attack food, feed, and fiber in farm storage and after the product leaves the farm. This problem is particularly important because grain and grain product losses caused by insects alone during farm storage, transportation, processing, wholesaling, retailing, packaging, and home storage, cost the American public over $1 billion a year.

The Stored Products Insects Branch does research on ways to keep insects out of food and fiber and on ways to eliminate infestations once they have occurred. Headquarters for this research is at the Plant Industry Station, but most of the research is done at field locations throughout the Nation.

Examples of this marketing research include developing and testing insect-resistant packaging; testing new insecticides, spray and aerosol devices, and insect repellents; searching for diseases that destroy insects but are harmless to animals and humans; and testing of chemical treatments to insure that their residues are not harmful to humans and animals when they are used as directed.

From this Branch have come findings that premium grade malathion can be used effectively on stored corn, wheat, and peanuts and that an emulsifiable DDT protects stored woolens for a full season from clothes moths and carpet beetles. The Branch has developed control methods in processing plants that keep insects out of nonfat dry milk. It has also recommended procedures for controlling cigarette and cigar beetles in tobacco warehouses.

N–41260

AMS marketing researcher making an adjustment on a quality-measuring machine so new that it has not been named. This device will check for quality defects in a variety of products from peanuts to potatoes.

Instrumentation Research Laboratory

The assignment of this laboratory is to develop instruments that will measure quality objectively without destroying the product. Instruments are designed, built, and tested by marketing researchers at the Plant Industry Station and other locations.

A new electronic bloodspot detector designed at the laboratory is now in commercial use in egg-grading plants. Tomato growers are getting a better measure of juice color because of the AMS developed colorimeter. Peanut growers are benefiting from a wide variety of instruments, one of which automatically draws off a more accurate sample than was heretofore possible.

New devices that measure the amount of hidden insect infestation in grain, detect water core in apples, and measure mold damage in corn are currently under test. Light penetration devices that detect hollow heart and black spot in potatoes and judge the maturity of apples are now being developed at the Instrumentation Research Laboratory.

Pioneering Research Laboratory

This laboratory does basic research on what happens within the cells of living things such as fruits and vegetables after they are harvested.

For example, scientists have long known that a gas called ethylene has much to do with the ripening of many fruits and vegetables. Some fruits and vegetables give off this gas in extremely minute amounts. What produces the gas within the product is still not known, but scientists have now identified one ethylene-producing enzyme and answered one more question about the life cycle of fruits and vegetables.

Grain Division

Seed Branch

The Federal Seed Act of 1939, which is enforced by AMS, requires complete and truthful labeling of seeds shipped in interstate commerce for seeding purposes and prohibits false advertising. It also prohibits the importation of seeds that fail to meet certain standards of quality.

To make sure that seedsmen are complying with the law, the Seed Branch each year examines hundreds of seed samples taken from interstate shipments by State inspectors and reported to represent shipments violating the law. These seeds are tested at the Federal seed-testing laboratory at the Center and, under the supervision of this laboratory, at various field laboratories.

Germination tests on these samples show the viability of seeds in each shipment. Purity tests to determine the percentage of pure seeds, weed seeds, crop seeds, and inert matter in seeds as well as the presence of harmful noxious-weed seeds are made by a seed-by-seed separation of a small representative quantity—for example, 50 grams of alfalfa or 500 grams of wheat.

The Seed Branch is responsible for conducting thousands of purity and germination tests annually on imported seeds. These seeds are sampled at various ports of entry by the Customs Service of the Treasury Department to determine whether they meet the minimum standards required. Tests of seeds imported or exported may also be requested on a fee basis. Tests on exported seeds, however, are not required by law.

The Seed Branch is also responsible for conducting the Origin Verification Service, which audits records to insure the correct origin of alfalfa and red clover seed sold in the United States by members of the Service.

Through an international arrangement sponsored by the Organization for Economic Cooperation and Development under the FAO, the Branch acts as a liaison agency between the U.S. State certifying agencies and the foreign certifying agencies in the certification of seeds as to variety.

Standardization and Testing Branch

Methods of harvesting and handling grain, beans, peas, rice, hops, and hay change with the improvement of har-

vesting machinery, drying equipment, and storage facilities. The various official standards involving grades for these crops are revised whenever market and other information indicates that such changes should be made.

Factors of quality of these crops and methods for their measurement are investigated. For example, the picker-sheller for harvesting corn has made it necessary to dry the corn artificially before it can be safely stored. In drying, cracks develop in the kernels of corn because of the rate at which moisture is removed. When this happens, the kernels have a tendency to break up when handled with the regular elevator handling equipment. Quality factors of this kind should, when practicable, be reflected in the standards.

Instruments and methods developed by the Market Quality Research Division for measuring the quality factors in grain and other products assigned to the Grain Division for inspection are tested and adapted for routine use.

Physical and chemical tests are made on various grains, grain products, and other commodities as part of the inspection program to determine compliance with Federal and other specifications under which the various commodities are purchased. In some areas, commercial and other laboratories are employed to make these tests for the Grain Division. The work of these laboratories is supervised by having about 10 percent of the tested samples sent to the Beltsville laboratory for review.

M–4641

Seed technologist preparing a sample of field pea seeds for a germination test. The device in his left hand automatically counts out the number of seeds desired.

FOREST SERVICE

Beltsville Experimental Forest

This 2,500-acre woodland on the east side of the Agricultural Research Center serves as a field laboratory for studying forest genetics, diseases, and insects.

Major emphasis in the forest-genetics studies is being placed on screening tests of more than 200 hybrid poplars. Many of these trees grow very fast, and some show resistance to harmful insects and diseases. Hybrids of poplar, ash, soft maple, and pine have been planted in the experimental forest at the Center.

Studies concerned with chestnut blight, which practically destroyed the American chestnut species early in the 20th century, include the testing of Asiatic chestnut introductions.

Insects are abundant in the pine-hardwood forests of the Piedmont region and, like fire and disease, are factors in the management of the woodland. The biology and ecology of the more important insects and their biological and chemical control are being studied at the field laboratory at the Center and in the surrounding States. The activity of the insects and the losses they cause are surveyed periodically as part of the insect research program.

Forest Physiology Laboratory

Fundamental knowledge of tree growth is being sought in a tree physiology laboratory established in 1958, under the supervision of the Division of Forest Management Research. The long-range program of research adopted for the laboratory will include the inorganic nutrition of forest trees; the mycorrhizal relationship in trees; the effect of photoperiod and thermoperiod on growth and development; and the absorption, translocation, and site of action of growth-regulating compounds such as herbicides. Examples of current studies are the foliar absorption of phosphorus and its movement in the tree and the effect of nutrient level on the development of mycorrhizae. Research findings under the controlled conditions of the laboratory furnish guidance for practical experimentation in the woods to improve the growth of trees.

Beltsville Forest Insect Laboratory

The Division of Forest Insect Research, which is responsible for studies of forest, shade-tree, and wood-products insects, has one of its field laboratories at the Center. This laboratory does research on basic and applied problems of national scope, including the following principal lines of work: Research on airplane spraying for control of forest insects; development of aerial survey methods for determining the extent and severity of infestations in forests; investigations on the control of termites and powder-post beetles; studies on the toxicology of various groups of insecticides to determine how they can be made most effective against different kinds of forest pests; and investigations of biological agents that attack insects but are harmless to man and animals.

Studies on airplane spraying are carried on in cooperation with the Agricultural Engineering Research Division of ARS. These include work on spray equipment for light and transport type airplanes and helicopters to develop application equipment and chemical formulations that will give the most efficient distribution over the forest. Particular emphasis is given to such basic factors as the effect of airflow forces about the aircraft, speed of the aircraft, and degree of atomization of the spray. Research on aerial surveys includes the evaluation of special devices and techniques for visual observation, aerial photography, and photointerpretation. Airplanes specially equipped as "flying laboratories" are based at the Center airfield for these studies.

The toxicological studies are directed toward finding out what happens to different chemical insecticides after they reach a tree; how an insect acquires a lethal dose; and how the insecticide kills the insect. Insect pathology studies are concerned with insect pathogens—their virulence and mode of action, means of propagation and methods of storing them, and techniques of applying them for maximum usefulness.

Beltsville Forest Disease Laboratory

The Division of Forest Disease Research, which is responsible for investigating the cause and control of diseases of forest trees and forest products, has one of its laboratories at the Center. This laboratory provides authoritative identifications of cultures of forest fungi, develops and improves techniques for maintaining forest fungi in culture and for identifying them by their cultural characteristics, and determines the physiological and nutritional requirements of important forest fungi.

To facilitate this work, the laboratory maintains one of the world's largest collections of living cultures of fungi that cause disease and decay of living forest trees and deterioration of forest products. This ever-expanding collection includes about 9,000 isolates of over 700 species of fungi. A herbarium of the sporophores from which the cultures were made is maintained for reference purposes.

Beltsville Radio Laboratory

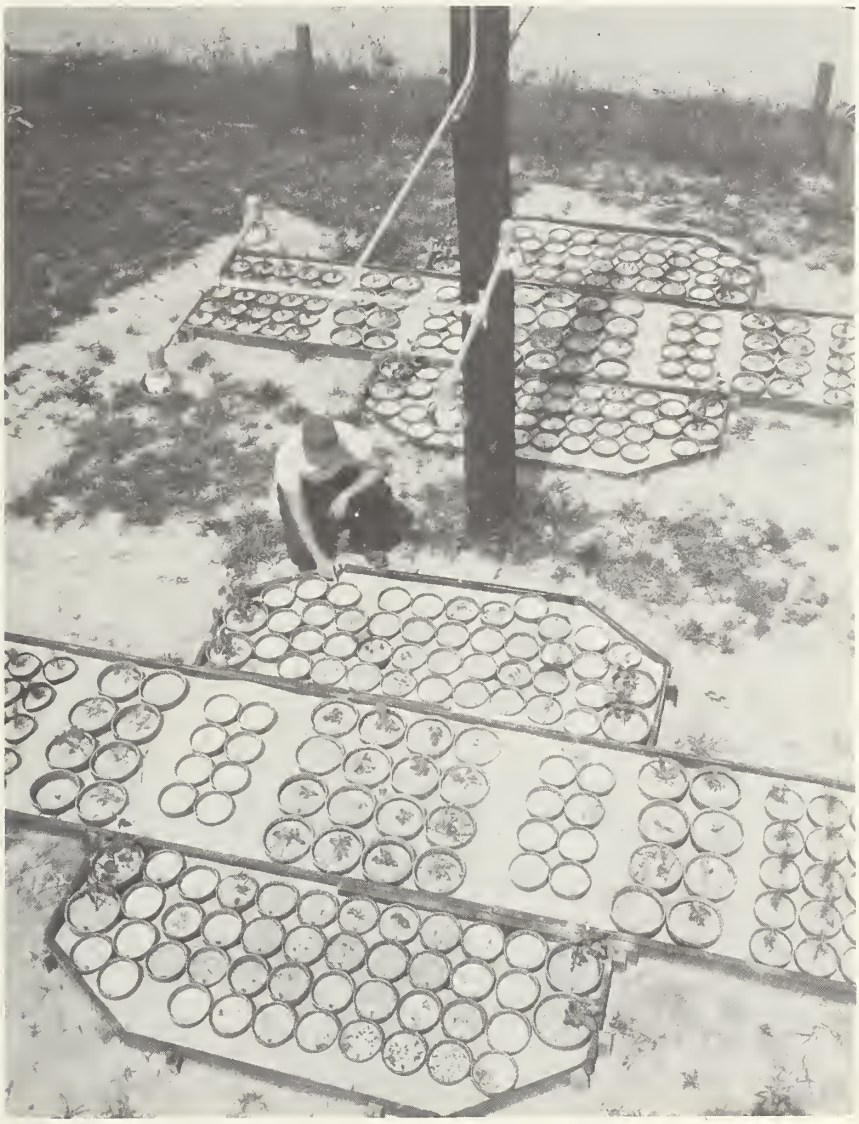
This laboratory has long been maintained as the primary center through which the special radio equipment re-

quirements of the Forest Service may be presented to those companies interested in manufacturing to meet service needs. More recently, the laboratory has been expanded to provide a similar service in the field of general electronics equipment, particularly as may be proposed for application in fire detection and fire suppression activities.

Laboratory engineers have developed (and currently maintain) the specifications for radio equipment that are used in servicewide procurement contracts. They test for specification compliance samples of all equipment offered by industry for Forest Service use, and they work with industry engineers in developing special modifications necessary to meet particular requirements.

Laboratory engineers also consult with Forest Service field people in developing radio installation and maintenance standards and in training maintenance technicians.

In the field of general electronics, laboratory engineers serve as consultants to foresters in determining the feasibility of new techniques and in developing specifications for special electronic devices. They also provide a center with which industry may work in developing ideas or equipments to meet particular Forest Service needs.



S–1567

Response of forest tree seedlings to photoperiod is studied under outdoor conditions with natural daylength supplemented with floodlights.

NATIONAL AGRICULTURAL LIBRARY

The National Agricultural Library is one of the basic units in the research, extension, and regulatory work of the Department and the State agricultural agencies. It contains 1,200,000 volumes and is one of the most extensive agricultural research collections in existence.

The Library acquires, records, and makes readily available for reference and lending, important books, periodicals, and other publications containing information on the subject fields covered by the Department. Its catalogs, special indexes, and bibliographies furnish an invaluable key to the literature in the field of agriculture and related sciences.

The Main Library, including the Law Branch, is located in Washington, D.C. The Beltsville Branch and the Bee Culture Branch, specialized collections designed to serve specific scientific fields, are located at the Agricultural Research Center.

SOIL CONSERVATION SERVICE

National Plant-Materials Center

The National Plant-Materials Center of the Soil Conservation Service (SCS) is located at the Agricultural Research Center. Here, plants are tested for soil and water conservation and other uses. Because vegetation is fundamental in conservation farming, grasses, legumes, and forbs, as well as trees and shrubs, are studied. These may come from the wild, from abroad, or from research agencies. Attention is given to vegetative characteristics, fruiting habits, simplicity of reproduction, soil-conserving qualities, propagation, seeding, culture, and seed harvesting and processing.

Plants that show superior conservation values are increased and given further tests at 17 plant materials centers and on farms in soil conservation districts. They are checked by farmers, ranchers, or technicians for farm, range, forest, and wildlife conservation. Once proved, the plants reach farmers and ranchers through regular commercial channels.

Soil Surveys

At the Plant Industry Station, scientists have completed maps of many countries and are working on many others that will be part of a world soil map. A soils laboratory does the more complex analyses in support of soil-survey work throughout the country and performs special studies on different kinds of soils. A group of scientists and editors in the South Laboratory Building at the Center make the final compilation and edit the maps and text of soil-survey reports from all over the country. Soil scientists also work on the classification and correlation of hundreds of different kinds of soils and on the development of standard descriptions.

The Cartographic Division, headquartered in the North Laboratory

N–35158

Layout of National Plant-Materials Center, Soil Conservation Service, at the Agricultural Research Center.

Building at the Center, prepares the Soil Survey maps. It maintains facilities for making and reproducing maps, charts, mosaics, aerial and still photographs, and technical drawings. This service unit supplies many of the materials used by technicians and farmers in making overall and detailed plans for applying conservation measures throughout the United States. Because of its location, it also provides complete cartographic services for the field offices of the Soil Conservation Service in the Northeastern States.

Engineering and Design

The Central Technical Unit of the Engineering Division is located in the Soil Management Building at the Center. It develops, improves, and studies the effectiveness of hydrological and geological techniques and procedures required in planning and installing SCS programs.

The Washington Design Section of the Engineering Division (1) develops standards to be used nationally in preparing plans for conservation structures, (2) prepares standard plans for commonly used structures for use of field engineers, (3) trains field engineers in specific procedures of layout and design of structure, and (4) prepares technical data and handbook material for use in guiding field operations. This Section is housed in the Cartographic Annex at the Center.

BUREAU OF SPORT FISHERIES AND WILDLIFE, FISH AND WILDLIFE SERVICE OF THE DEPARTMENT OF THE INTERIOR

Closely related to agriculture is the work of the Patuxent Wildlife Research Center, one of the Nation's larger stations for investigating wildlife management problems. This Station, located immediately east of the Agricultural Research Center, is administered by the Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service of the U.S. Department of the Interior. On its 2,670 acres are laboratories, lakes, forests, and farms, all devoted to research on management of wildlife.

The emphasis at the Station and throughout the Bureau of Sport Fisheries and Wildlife is on finding ways to meet tomorrow's fish and wildlife needs. The Nation's population is expanding explosively—200 million are expected by 1970 and 300 million by 2000. In terms of recreation, more people mean greater needs for and larger demands on fish and wildlife resources. A survey in 1960 showed that 50 million of the 130 million Americans over the age of 12 went hunting or fishing or both in that year—nearly 2 out of every 5 persons in this age group. With sharp population increases expected, less land and fewer natural water areas will be available in the future to produce much sought-after fish and game. Through better land-use planning and research, this threat of shrinking natural habitat is being challenged.

At the Wildlife Research Center, land use in relation to wildlife production is a major subject of investigation. Land-management practices designed to aid farmers in producing wildlife crops along with essential food crops are being developed and field tested on three experimental farm areas. On one farm, the clean-fencerow method is used. On another, modern soil- and water-conservation practices are used. On the third, a combination of old and new land-use techniques are used.

Striking differences in wildlife productivity are seen in these areas. When hunted, the conservation farm has produced two and one-half times and the combination farm three and one-half times as many rabbits as the clean farm. The fall bobwhite-quail populations are 1 per 2 acres on the conservation farm, as compared to 1 per 3 acres on the combination farm and 1 per 4½ acres on the clean farm. Songbirds are substantially more numerous on the conservation farm than on the clean farm, and the former is more attractive and pleasant.

Bird control of insects is being studied on a small scale. Methods for appraising the extent of crop damage caused by birds are being developed. Materials and techniques for controlling birds and bird damage are being tested in the laboratory and in the field.

Design and effective management of waterfowl habitats are being demonstrated on a score of Wildlife Research Center impoundments, most of which were established in former swamps, gravel pits, or similar waste areas such as occur on many farms. Water-level management, including use of alternating summer drawdowns in dark-stained-acid waters, is being emphasized as a means of increasing supplies of natural waterfowl foods. On approximately 160 acres of such developed water areas, up to 3,000 migratory waterfowl have found suitable environment for a major part of the winter where no waterfowl previously existed. In 1959, at least 66 waterfowl broods, totaling 415 young, were produced on this impounded acreage. Included in this production were wood ducks, mallards, Canada geese, black ducks, and pied-billed grebes.

The Wildlife Research Center is the headquarters and nerve center for all banding of migratory birds on the Continent, for national recordkeeping on bird distribution, and for gathering and statistically analyzing bird-population data. More than 1,500 qualified volunteer ornithologists in Canada and the United States cooperate with the Center in banding and distribution studies.

Diagnostic work and research on diseases and parasites of wildlife are an important part of the Station's program.

Special attention is being directed to trichomoniasis, a serious protozoan disease of doves and pigeons; to distemper in native carnivores; and to parasites of Canada geese and other waterfowl. In cooperation with other agencies, field studies on the vectors and hosts of eastern equine encephalitis virus are being pursued. An extensive survey is being made of the diseases and parasites of migratory blackbirds to determine whether such knowledge can be used to develop a biological control technique for these birds.

Control of insect pests is an essential part of modern agricultural practice, but, unfortunately, some of the more effective insecticides are toxic to fish and wildlife. The Wildlife Research Center is conducting research to determine the extent of pesticidal hazards to mammals and birds, and to aid in developing safer materials and techniques.

Although administratively independent of the Agricultural Research Center, many activities of the Patuxent Wildlife Research Center are closely allied with those of the Agricultural Research Center in contributing to better farm living.

FOOD AND DRUG ADMINISTRATION OF THE DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

For many years the Food and Drug Administration has done its research on veterinary drugs at a 10-acre site at the Agricultural Research Center. A new large animal laboratory-barn has recently been completed there.

Plans are underway to build another research facility on a 195-acre tract of land transferred to the Department of Health, Education, and Welfare by the Center. The laboratory complex, to be staffed by chemists and other scientists, will also provide housing for experimental animals, mainly dogs. These facilities are being designed for research in many areas of foods, drugs, and cosmetics.

GODDARD SPACE FLIGHT CENTER OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

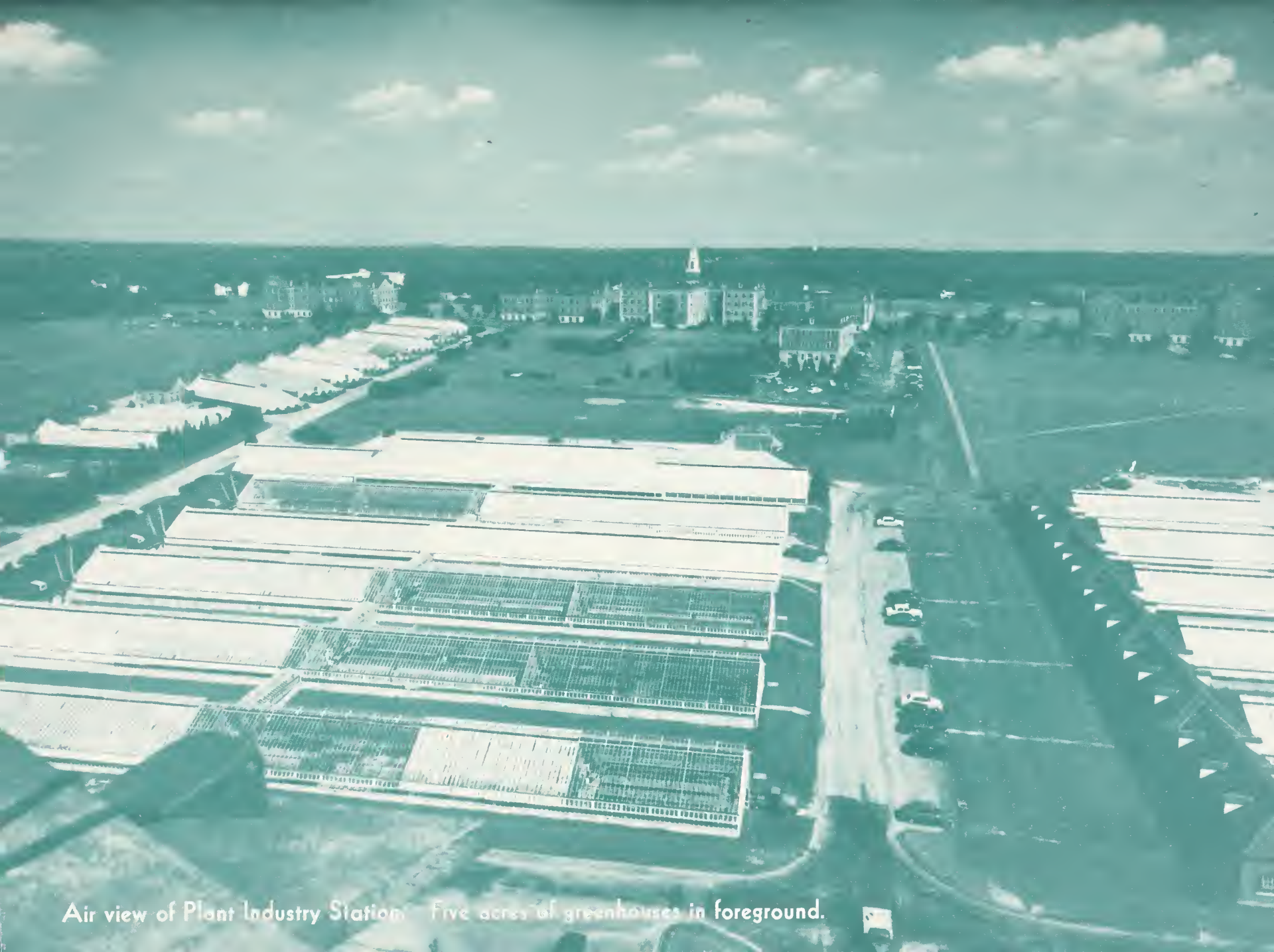
When the National Aeronautics and Space Administration was formed in late 1958, Congress authorized the creation of a new research center to be called Goddard Space Flight Center. The new establishment was located on land formerly a part of the Agricultural Research Center.

Goddard Space Flight Center is the Nation's first major installation devoting its entire efforts to the peaceful study and exploration of space and the earth's relationship to it. The Center's capabilities extend through the full range of the space science spectrum, from theory to experimental work, fabrication of "hardware," and occasional launch, to data acquisition and data reduction.

Its mission includes sounding rockets out to one earth radius; space probes beyond one earth radius; scientific satellites; applications satellites (weather and communications); tracking and data acquisition of most NASA manned and unmanned spacecraft.

The 550-acre Center, named after Dr. Robert H. Goddard, father of American rocketry, was dedicated in March 1961. Its buildings, many of which are still under construction, house scientific, technical, administrative, and shop personnel engaged on complex space science projects. Its staff numbers approximately 2,400 people.

U.S. GOVERNMENT PRINTING OFFICE: 1962 O - 648936



Air view of Plant Industry Station. Five acres of greenhouses in foreground.